MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

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## EXPORTS TO THE UNITED STATES

*Opportunities for Increasing Volume*

UNITED KINGDOM exports to the United States during 1959 totalled £360 millions. Of this figure cars accounted for £86·7 millions. According to an authority these figures can be improved.

Representatives of the American Chamber of Commerce, the Association of British Chambers of Commerce, the Board of Trade, the Council of Industrial Design, and the National Union of Manufacturers, met recently to discuss the use of new factoring techniques to swell the volume of British exports to the U.S.A. The guest of honour, Mr. Charles L. Harding, Jr., president of Meinhard & Company Inc. of New York, one of the largest factoring organizations in the U.S.A., announced that his company, in association with Alexandria Finance Co., Ltd., of 25-35 City Road, London, E.C.1, plans to provide facilities for British exporters which would enable them to compete on an equal footing with American domestic manufacturers.

'The average British exporter', said Mr. Harding, 'barely scratches the surface of the American market'. Enquiries by his organization had revealed that hundreds of retail outlets in hundreds of small towns throughout the length and breadth of the U.S.A. had never stocked British lines. 'I don't want to be too critical', he said, 'but many of your British exports are of the highest quality and could be made available at competitive prices in far greater volume than is the case at the present'. European manufacturers, especially the Germans and Italians, were fully alive to the methods of selling represented by the factoring organizations, and their export figures were steadily climbing.

Mr. Harding suggested that the British exporter was too bound by traditional methods of selling which did not take into account the reluctance of many American buyers to order from overseas suppliers who were unable, or unwilling, to extend competitive lines of credit or to quote inclusive prices 'free customers' warehouse'. Factoring techniques would enable exporters to overcome these difficulties, thereby opening up the prospect of sales in outlets hitherto the exclusive preserve of goods of United States manufacture.

The essence of the factoring service provided by Meinhard, in conjunction with the Alexandria Finance Co., is to permit the British exporter to give American customers credit terms allowing 30, 60 or 90 days' payment after delivery, thus, without financial risk, the British exporter can give his American customer the same facilities as the customer now receives from American domestic manufacturers.

It is a known fact that American buyers are discouraged from buying British goods where they have to make payment by Letter of Credit, assume responsibility for shipment, Customs' clearance, etc. To meet this objection factoring can provide, in addition to the extension of credit and the guaranteed remittance of sales revenue, a comprehensive service which relieves the buyers of all this procedure. Factoring will further advise and assist in the appointment of competent sales representation on a national basis.

Mr. Harding referred to figures of British exports to America and said that with certain exceptions, including motor-cars and machinery, there was no reason why 1959 figures could not be doubled within a period of 12-18 months. In his view, this was perfectly feasible if British manufacturers relied on factoring to develop imports in towns and cities in which British goods were rarely seen.

'It is not', he said, 'necessary to open expensive branch offices or agencies or to form companies under complicated state laws, to compete with the high pressure sales techniques of American business, but it is logical to utilize the comprehensive service of factoring agencies who have, over several decades, acquired extensive experience of selling to markets which cannot easily be reached by British exporters'.

*Pour les lecteurs de l'étranger*
*Für unsere ausländischen Leser*
*Para los lectores de ultramar*

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*For readers overseas*

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**Une installation automatique pour le stockage en vrac et la manutention des matières premières d'une biscuiterie.** page 770

L'une des plus anciennes biscuiteries anglaises, la Carr & Co., Ltd., de Carlisle, vient de monter une nouvelle installation très complète qui permettra de réaliser une automation intégrale dans la fabrication des biscuits. Depuis quelques années déjà, on utilise des techniques de régulation automatique pour les fours à biscuits et une automation complète du pré-emballage mais il a fallu faire intervenir dans une large mesure des procédés manuels pour la manutention des matières premières. Grâce à cette nouvelle installation, les différentes opérations sont effectuées automatiquement, depuis la livraison des matières premières jusqu'au moment où la pâte arrive aux fours.

**La manutention dans une fabrique de chemises** page 775

*Par H. G. Vallings, A.M.I.Mech.E.*

L'installation d'un convoyeur aérien dans l'atelier de pressing et de pliage de la fabrique de chemises du Great Universal Stores Group a permis d'obtenir un rendement plus élevé. Ce convoyeur supprime non seulement un certain nombre de chariots qui occupaient une aire précieuse mais permet également d'entreposer environ 240 chemises repassées sans risquer de les abîmer ou de les salir.

**Batteries de traction pour le matériel de manutention et de transport électrique** page 783

*Par C. C. Richards, A.M.I.Mech.E.*

Dans cet article, Mr. Richards passe en revue quelques-uns des récents progrès effectués dans la conception des batteries. L'auteur étudie premièrement les avantages des véhicules de traction électriques et ensuite les principales particularités des différents types de batteries alkalines et au plomb et termine par une description des principaux types que fournissent actuellement les grandes marques britanniques. On trouvera également dans l'article des exemples de véhicules qui utilisent des batteries de traction du type renforcé.

**Le trottoir roulant de Londres** page 791

Cet article décrit la plus grande réalisation exécutée par le Metropolitain de Londres dans la City de Londres depuis la guerre et considérée comme étant le plus grand trottoir roulant du monde. Ce trottoir roulant qui a reçu le nom de Travolator mesure 95 mètres de long et est installé sur une rampe de 8,5° ; il a été étudié pour transporter plus de 20.000 personnes à l'heure à une vitesse de 55 mètres/minute.

**Roulements à billes géants pour les grues d'installations portuaires** page 795

*Par Henry L. Lloyd, O.B.E., M.C., B.A. (Cantab)*

Cette étude abondamment illustrée est consacrée à l'utilisation des plates-formes à roulements à billes pour grues d'installations portuaires, en comparaison des solutions classiques. Ces roulements sont maintenant fabriqués en Grande-Bretagne et sont montés sur un certain nombre de nouvelles grues d'installations portuaires et sur d'autres modèles de grues.

**La grue Linden monte** page 800

*Par D. M. Potter, B.A.(Oxon)*

Cette grue montante présente l'aspect d'une grue à tour peu élevée et a les mêmes applications qu'une grue à tour d'une hauteur illimitée, étant donné qu'au fur et à mesure que le bâtiment monte, la grue monte elle-aussi. La flèche de la grue montante est donc toujours à la hauteur voulue au-dessus du sommet de l'ossature sans qu'il soit nécessaire d'avoir recours à une haute grue à tour, engin coûteux. On trouvera une description de cette grue en service sur un chantier du Nord de l'Angleterre.

**Le "Cub" Reliance à l'oeuvre** page 809

Cet article est consacré à la description d'un nouveau tracteur industriel léger à moteur Diesel donnant une traction à la barre de 998 kg. Ce véhicule de faible encombrement qui ne fait que 1,80 m. de longueur hors tout et 1 mètre de largeur, possède une excellente maniabilité dans les espaces réduits. Il est équipé d'un moteur Diesel bicylindre refroidi par air développant 20 CV au frein et lui donnant une gamme de vitesses de 6,3 km./h. en première à 19,3 km./h. en troisième.

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## INHALTSÜBERSICHT AUF DEUTSCH


**Automatische Anlage fur Schüttgutlagerung und Materialzufuhr in einer Keksfabrik** Seite 770

Bei der Fa. Carr & Co. Ltd., Carlisle, einer der ältesten Firmen [illegible] der Keksbäckereiindustrie, wurde kürzlich eine neue Grossanlage eingebaut, welche zur Vollautomatisierung der Keksbäckerei führen soll. Schon seit mehreren Jahren kommen neue Methoden der automatischen Backofensteuerung sowie der vollautomatischen Keksverpackung zur Anwendung, wobei jedoch immer noch in grossem Umfange manuelle Arbeiten

bei der Behandlung der Rohstoffe erforderlich waren. Bei dieser neuen Anlage läuft die automatische Steuerung an, wenn die Rohstoffe an den Öfen ankommen.

**Förderanlage in einer Hemdenfabrik** Seite 775

*Von H. G. Vallings, A.M.I.Mech.E.*

Eine bessere Rationalisierung konnte in der Press- und Zusammenlegeabteilung der Hemdenfabrik des Konzerns Great Universal Stores durch die Anlage eines kontinuierlichen Überkopffördersystems erreicht werden. Mit dieser Anlage wurde nicht nur eine Anzahl platzraubender Flurförderer ausgeschaltet, sondern auch Lagerplatz für 240 gebügelte Hemden geschaffen, die hier ohne jede Gefahr der Beschädigung oder Verschmutzung aufbewahrt werden können.

**Zugbatterien für elektrische Förder- und Hebeanlagen** Seite 783

*Von C. C. Richards, A.M.I.Mech.E.*

Im vorliegenden Artikel behandelt der Verfasser einige der jüngsten Fortschritte auf dem Gebiet der Batteriekonstruktion. Zunächst befasst er sich mit den Vorzügen batterieelektrisch betriebener Zugwagen, sodann mit den Hauptmerkmalen verschiedener Alkali- und Säurebatteriearten und schliesslich mit den heute im britischen Handel erhältlichen Hauptbatterietypen. Ferner werden Beispiele für Fahrzeuge gegeben, bei denen Hochleistungs-Zugbatterien zur Anwendung kommen.

**Londons neue Passagier-Rollbahn** Seite 791

In diesem Artikel wird das grösste bisher von der Londoner Untergrundbahn seit dem Kriege durchgeführte Einzelprojekt beschrieben, das insofern einziggartig ist, als es sich hierbei um die grösste Passagier-Rollbahnanlage der Welt handelt. Unter der Bezeichnung 'Travolator' bekannt, erstreckt es sich über eine 95 m lange Schrägstrecke mit einer Neigung von 8½° und kann mit einer Geschwindigkeit von 55 m/min über 20.000 Passagiere befördern.

**Riesenkugellager für Hafenkrane** Seite 795

*Von Henry L. Lloyd, O.B.E., M.C., B.A. (Cantab)*

Dieser Artikel ist eine ausführlich bebilderte Abhandlung über die Zweckmässigkeit kugelgelagerter Drehkränze bei Hafenkranen gegenüber den herkömmlichen Methoden. Mit diesen jetzt in Grossbritannien hergestellten Lagern wird eine Anzahl von Hafen- und anderen Kranen ausgerüstet.

**'Linden' Kletterkrane** Seite 800

*Von D. M. Potter, B.A.(Oxon)*

Dieser Kletterkran hat das Aussehen eines kurzmastigen Turmdrehkrans und die gleiche Anwendung wir ein Turmdrehkran unbegrenzter Höhe, denn im gleichen Masse wie das Gebäude in die Höhe wächst, klettert der Kran mit. Der Ausleger des Kletterkrans befindet sich somit stets in zweckmassiger Betriebshöhe über dem Gebäude und erspart den Aufwand eines hohen Turmdrehkrans. Der Artikel beschreibt den Einsatz dieses Krans auf einem Baugrundstück im Norden Englands.

**Der Reliance-Schlepper 'Cub' im Einsatz** Seite 809

Hier wird ein neuer dieselbetriebener Industrie-Kleinschlepper mit einer Zughakenleistung von 998 kg beschrieben. Bei einer Baulänge von nur 1,8 m und Gesamtbreiten von 1 m handelt es sich hier um ein sehr kompakt gebautes Fahrzeug, das auch auf beschränktem Raum eine hervorragende Wendigkeit aufweist. Es hat einen luftgekühlten Doppelzylinder-Dieselmotor mit einer Bremsleistung von 20 PS und einen Geschwindigkeitsbereich von 6,3 km/h im 1. Gang bis 19,3 km/h im 3. Gang.


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# SUMARIO EN ESPAÑOL

**Planta automática para almacenaje a granel y manipulación de ingredientes en una fábrica de galletas** Pág. 770

Una de las más antiguas firmas de la industria de fabricación de galletas y bizcochos, Carr & Co., Ltd., de Carlisle, ha instalado recientemente una extensa nueva planta que está proyectada para proporcionar la automatización completa en la fabricación de bizcochos y galletas. Ya hace ahora algunos años que vienen funcionando sistemas de técnica y control automáticos de las galletas en los hornos, así como la automatización completa del preembalaje de las galletas, pero ha sido necesaria en una extensa medida la manipulación manual para el movimiento de los ingredientes. Con estas nuevas instalaciones, el control automático se encarga de todas las operaciones desde la llegada a la fábrica de los ingredientes hasta el momento en que las galletas llegan a los hornos.

**Manipulación en una fábrica de camisas** Pág. 775

*Por H. G. Vallings, A.M.I.Mech.E.*

Se ha conseguido mayor eficiencia en el departamento de planchado y plegado de la fábrica de camisas del Great Universal Stores Group instalando un transportador elevado continuo. Dicho transportador no solamente elimina un cierto número de carretones que ocupaban un valioso espacio del piso, sino que también proporciona almacenaje para unas 240 camisas planchadas, sin temor de que se dañen ni manchen.

**Baterías de tracción para equipos de manipulación y transporte eléctricos** Pág. 783

*Por C. C. Richards, A.M.I.Mech.E.*

En este artículo el Sr. Richards trata de ciertos recientos adelantos en el diseño de baterías. Los méritos de los vehículos de tracción eléctrica a baterías vienen tratados primero, y seguidamente los distintivos principales de diversos tipos de baterías tanto alcalinas como ácidas, y finalmente viene una descripción de los principales tipos existentes ahora por los fabricantes británicos más destacados. También vienen ejemplos de vehículos en los que se usan baterías de tracción del tipo pesado.

**La acera móvil de Londres** Pág. 791

Vienen aquí descritas las obras más grandes que se han realizado en la City de Londres dentro de los ferrocarriles subterráneos desde que terminó la guerra, distinguiéndose por el hecho de que puede afirmarse que constituyen la acera móvil más grande del mundo. Se la ha designado "Travolator," y se extiende a lo largo de 95 metros por una pendiente de 8½ grados, habiendo sido construída para transportar, por hora, 20.000 viajeros o más, a una velocidad de 55 metros por minuto.

**Cojinetes a bolas gigantes para grúas de muelle** Pág. 795

*Por Henry L. Lloyd, O.B.E., M.C., B.A. (Cantab)*

Este es un estudio totalmente ilustrado del uso de los anillos de rotación constituídos por grandes cojinetes a bolas para las grúas de los muelles, diferenciándose así de los métodos convencionales. Estos cojinetes se fabrican ahora en la Gran Bretaña y en el momento actual se están instalando en un cierto número de grúas nuevas para muelles y de otros tipos.

**Grúa trepadora Linden** Pág. 800

*Por D. M. Potter, B.A. (Oxon)*

Esta grúa trepadora tiene el aspecto de una grúa de torre de mástil corto, con las mismas aplicaciones que una grúa de torre de altura ilimitada, puesto que, a medida que sube el edificio, va subiendo con él la grúa. De esta manera, la pluma de la grúa trepadora está siempre a la altura en que se trabaja por encima del edificio, sin incurrir el gasto de una grúa de torre alta. Viene dada una descripción de esta grúa en el emplazamineto de unas obras en el Norte de Inglaterra.

**El pequeño 'Cub' Reliance en acción** Pag. 809

Se trata de la descripción de un nuevo pequeño tractor industrial a motor diesel, cuya fuerza de tracción en la barra es de 998 kilogramos. Con longitudes totales que no pasan de 1,8 metros y un ancho total de 1 metro, resulta un vehículo sumamente compacto que proporciona una maniobrabilidad excelente en espacios reducidos. Va provisto de un motor diesel de dos cilindros enfriado por aire cuya potencia es de 20 HP efectivos, siendo su gama de velocidades de 6,3 km/h en primera a 19,3 km/h en tercera.


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D. S. C. Fraser

# SIMPLIFIED FREIGHT HANDLING

An innovation in freight handling, recently started in New York City, may prove to be one of the most advanced terminal materials handling methods in the motor freight industry. Switch carts which have a simple guiding and connecting system, and a drag line operated by two 5-h.p. electric motors, are the principal devices used. For most of the day, one control clerk at a dispatch control centre can process all freight. However, at peak periods, three men, each on different control lines, can handle three times as much freight.

In a conventional terminal operation, a dock worker must seek out shipments for the truck he is loading. This, more often than not, involves a time-consuming search of racks, pallets and other areas. Under this new method, with a shunt line system and switch carts, freight automatically finds its own way to the correct loading door.

Two independent, but integrated, concentric tow lines move freight within the terminal. The outer one conveys shipments from the receiving door to the dispatch control centre, through which all freight passes. The inner, or shunt line, works with the switch carts to feed freight to truck bays. Because of the shunt line system, it is not necessary to have 'inbound' and 'outbound' sides of the terminal, as is customary in most freight terminal operations.

Carts are manually loaded at the incoming loading docks, with the shipment broken so that each cart contains packages for a single destination. When the cart is fully loaded, it is centred over the slot for a drag line which runs around the outer portion of the warehouse. A connecting bar is dropped and the cart is automatically hauled in a rectangular path until it reaches the control area. Here it is automatically weighed and its weight is printed out for comparison with the declaration.

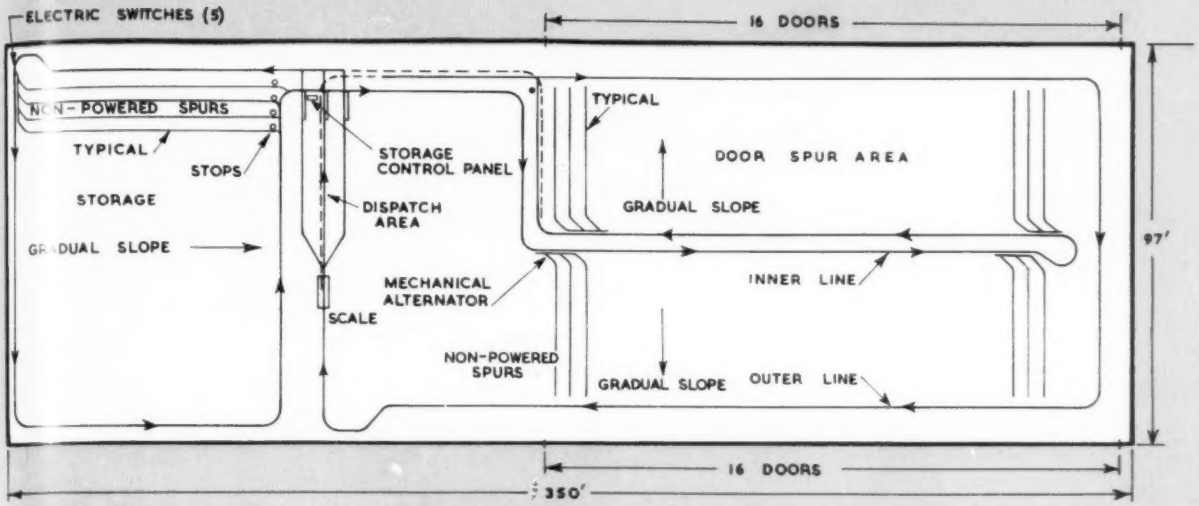
This new installation has been put in to the New York City terminal of Spector Freight Systems, Inc., and is the prototype for 15 other terminals, to be constructed by this company, in various cities in the United States. Here is how a typical unload-load sequence works:

*Counters for the switch carts are set for the number of the loading dock desired. When the proper track is reached, the rod which connects the truck to the drag line is retracted and a guide rod drops into the spur-track guide slot to the left, diverting the cart off the drag line*

*Outboard Freight.* Picked up in New York City for delivery to customers in other cities: City pick-up trucks covering assigned routes in the city area, at the end of the working day, will back up to assigned spots at the terminal. Freight on these trucks is to be unloaded by shipment and moved to the over-the-road trailer for the city to which the freight is consigned. At the stripping or unloading door, empty switch carts have been sent into the three-spur tracks by the dispatcher. The dock man removes an empty from the spur, pushes it to the door or into the truck, unloads one order on one waybill, places the waybill in the billholder, places the switch cart on the outer line, which conveys it to the dispatcher. With the gradual slope, switch carts at the door spurs roll to the front of the spur, so that after placing the loaded switch cart on the outer line, the dock man takes another empty from the front of the spur and continues unloading the pick-up truck.

As the loaded switch carts placed on the outer line approach the dispatch area, they cross a scale, which automatically subtracts the tare weight of the switch cart and records net weight of the shipment, printing this weight at the dispatcher's table, so that he can compare actual weight with declared weight.

After crossing the scale, the switch cart rolls into the dispatch area and can be diverted into any of three lines by the dispatcher through the control panel. As the switch cart reaches the dispatcher, he checks the waybill for the destination city, determines the door at which the trailer for that city is being loaded, then sets the switch cart dial for that door, pushes the cart to the inner conveyor, which carries it to the door, where it automatically switches off of the power tow-line on to the non-powered spur. With the mechanical alternator at each door, switch carts will alternate between line 1, 2 and 3. As the door spurs are filled (maximum capacity 18 switch carts), dock men will be sent by the foreman to that door to load the trailer. The dock man removes




*Flow diagram of the switch cart system installed at the New York City Terminal of Spectator Freight Systems, Inc.*

the loaded cart from the spur, pushes it into the trailer, unloads the freight and places the empty on the outer line. Again, switch carts continually feed to the front of the spur. The outer line conveys the empty to the dispatcher, who then sends it to doors where empty carts are being used for stripping.

*Inbound Freight.* Freight coming into the city in trailers from other cities, to be unloaded and sorted into city delivery trucks by delivery route: This operation is essentially the same as that described above except that, because of the time cycle, freight is arriving throughout the day but is all loaded out early in the morning, considerable storage is required. In addition, it is important that freight is loaded into city delivery trucks in reverse order of unloading, the first freight to be delivered should be on the rear, last on the front. As the unloaded freight is conveyed across the scale and into the dispatch area, the dispatcher determines two things: 1, delivery route, for which he sets the dial on the switch cart; and 2, location along the delivery route, and whether the freight should be stored in the front, centre or rear of the delivery truck. In the storage area are five switches electrically controlled by the dispatcher on the storage control panel. The first switch would be for the front end freight, the second for centre freight, and the third for rear freight. The other two switches are for over, short and damaged shipments, miscellaneous storage, etc. After setting the switch cart dial, the operator presses the button corresponding to the storage area desired and pushes the cart to the outer tow line. Through a synchronized timer, when the switch cart has reached the desired switch, it electrically opens, diverting the tow pin from the power conveyor. The following cart pushes it into the non-powered spur and, through mechanical alternators, carts alternate between spurs for a given switch. With the gradually sloped floor, switch carts move to the front of the non-powered spurs, where they are halted by mechanical stops.

When the inbound freight is completely unloaded, switch carts have been sorted in the storage area by position in delivery vehicles, and the dials have been set for the proper loading doors. In the early morning, when the loading operation begins, stops are removed, starting at the top of the dock and working down and, by gravity, carts feed into the power conveyor and are carried to the proper door, where they mechanically switch into the door spur. After the storage lines are fully cleared, freight is at the correct door in proper loading sequence.

Carts are painted in five different colours, so that finer selection of freight can be easily made. Carts are removed from the door spurs, pushed into the city delivery truck, unloaded, empties placed on the outer line, conveyed to the dispatcher and sent to doors where the next unloading operation will occur.

The important features of this system, besides labour reduction, are the high degree of specialization and control provided with a continual backlog of work at any given point. With freight being unloaded at only four or five doors, it can be sent to any number of doors on the other side of the dock, with no people present in that area. Thus, the foreman has excellent control of his men, and their work is simplified and confined to one station. This leads to greater quality control, less over, short and damage to shipments, greater safety and flexibility to handle load changes. Dock men require less skill and training, so that turn-over is a minor problem and additional personnel can be added quickly and effectively. The whole operation leads to better and faster service and, as such, more freight can be handled in less dock space.

There are 450 switch carts used in the Spector Company's warehouse, and more than 1,500 ft in the drag line portion of the system, together with 5,000 ft of shunt track. In addition to the 32 doors served by the shunt spurs, there are 20 others at which larger pieces can be handled by fork lift trucks, although 90 per cent of this terminal's tonnage is handled by the drag line system. The complete installation, drag lines, carts, and docks cost $225,000, and has proved itself to be very adaptable for variations in load.

Carts and routing devices were manufactured by the S. I. Handling Systems, Inc., and the *towveyor* drag lines by Jervis B. Webb Company.

# Automatic Plant for Bulk Storage and Handling of Ingredients at a Biscuit Factory

By C. E. Parnall

*Fig. 1. This shows a series of bulk wagons ready to discharge their loads. Reading from the front backwards, these are lorries containing glucose, at more fat, two bulk sugar wagons and a bulk flour wagon*

One of the oldest firms in the biscuit making industry, Carr & Co., Ltd., Carlisle, have recently installed an extensive new plant, which is designed to lead to full automation in biscuit manufacture.

For some years now, methods of automatic biscuit oven control and technique as well as the full automation of biscuit prepacking have been in operation, but manual handling has been necessary to a large extent in dealing with the raw and processed ingredients when received at the factory, and in their subsequent control during conveyance to the mixers and to the final point of delivery, in dough form to the ovens. With the new arrangements bulk delivery in road tankers is made of flour, glucose, syrup and sugar. Automatic control takes over from the time that these ingredients are pumped from the tankers, to the stage where they arrive at the ovens correctly mixed to the prescribed recipe.

Automation is controlled by means of a punched recipe card which is inserted into the master control panel and calls for, obtains and deals with, the exact quantity of flour required for any particular biscuit. In addition a series of digital controls are preset for the required quantities of fat, syrup and glucose.

When ingredients are required, the mixer operator presses a request button which sends a signal to the control panel where the appropriate recipe card is selected causing the required quantity of flour to be delivered. Up to seven different kinds of flour could be supplied, each weighed exactly for any recipe. Any further requests which may be made meanwhile, are noted by the memory of the control board and are dealt with in rotation. In addition the control panel checks to see that the weight asked for is actually delivered, and it can arrange to compensate for minute variations.

All liquid ingredients are thermostatically controlled and coloured lights on the control panel indicate the precise situation and condition of every ingredient.

An outstanding feature in the design of this installation for the bulk storage and handling of the ingredients, is that it has been arranged to fit into an existing fabric. This was achieved by close co-operation between Carr's own engineering department, Thomas Robinson & Son, Ltd., who were the main contractors for the plant, and Elliott Brothers (London), Ltd., who were responsible for the electrical weighing, logic and control equipment.

**Different Types of Flour**

The plant has been designed for the intake of different types of flour either in bags or in bulk, sample testing of the flour after delivery to either of two test bins and easy return of rejected deliveries, storage in different bins, blending, weighing and delivery of requested batches to the dough mixers feeding the production lines, and for some precautionary treatment of the flour delivered to the plant.

Overall operation is from a main control panel which incorporates a punch card system and print-out facilities to record the day's work. The operation of the plant can be controlled either by completely automatic functioning of the control panel or a semi-automatic operation allowing for particular section close-downs. Provision has also been made for fitting motor start-ups under test conditions from the control room.

Two separate intake points from bulk vehicles are provided at ground floor level in the building which houses the test bins and main storage bins. One vehicle can be discharged while a second vehicle is manœuvred into position and coupled up. Vehicles can be discharged by their own engine-powered blowing units, but a land-based blowing unit has been provided for normal use to minimize noise, and for discharging vehicles not fitted with their own compressors. Intake from a bulk vehicle to the test bins is at the rate of 18 tons/hr. A sack intake unit is provided as an alternative.

When a bulk vehicle is coupled up the driver automatically requests the main controller to select the bin requiring to be charged, and on receipt of information that this has been done, the driver takes complete control over the discharge of his load into the pre-selected bin.

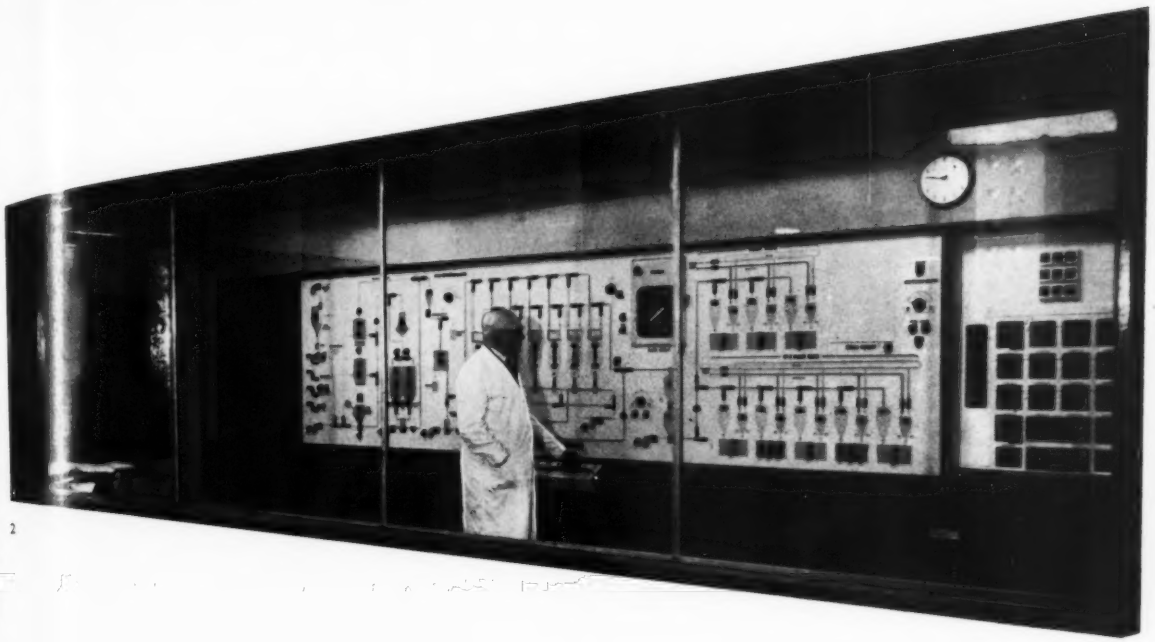


*Fig. 2. The master control panel. In addition to controlling the flour distribution plant, the panel incorporates a section to handle the distribution of sugar to the mixers. A punch card system is included in a separate section at the end. The panel operator is in touch with all strategic points in the plant by means of an intercommunication system*

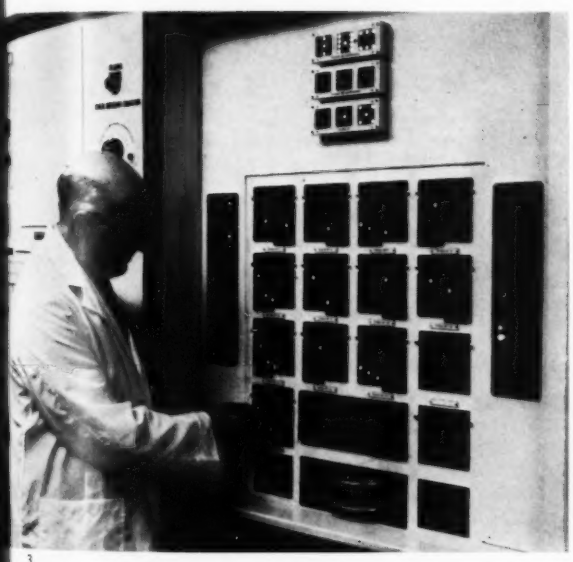


*Fig. 3. The recipe card section of the master control panel. The panel is controlling the delivery of flour and the 'domino' indicator at the top is repeating the weight of flour delivered at that moment (39·6 stones) to number 15 oven*

*Fig. 4. The blowing units below the main storage bins showing the twin worm bin dischargers which deliver flour to the rotary feeder valves via an intermediate hopper*

Two test bins each capable of accepting a full vehicle load of 15 tons are provided. One of these can be emptied while the other is being filled, so as to reduce delays to a minimum. If samples taken from the test bin are rejected the contents of the bin are returned to the bulk lorry or for resacking by a return blowing line.

Seven main storage bins each 47 ft high with a capacity of 31 tons have been installed in the existing granary building. Choice of bin is made possible by remotely controlled pneumatically operated diverter valves which divert the flour from the main conveying line into the specified bin.

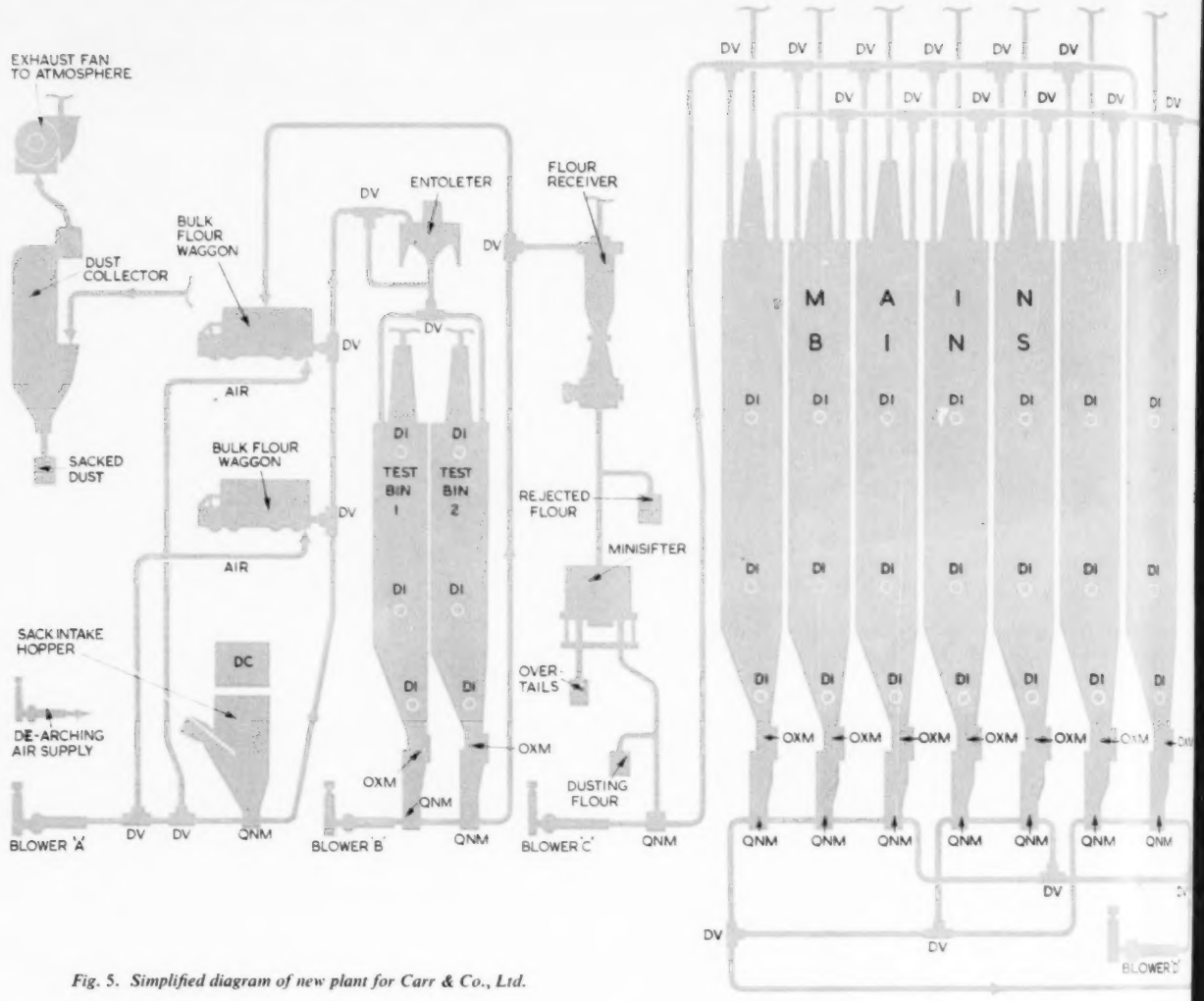



*Fig. 5. Simplified diagram of new plant for Carr & Co., Ltd.*

Four main operations are carried out in this part of the plant, all of which are controlled from the central panel. They are the delivery of flour from either test bin to any of the main storage bins; delivery of flour from a test bin to a bagging point for dusting flour; delivery of flour from a test bin to a reject bagging point, or back to a bulk vehicle.

A switch on the main control panel enables the controller to select the operation required. By pressing the starter button on the required test bin reproduced in mimic form on the panel the correct delivery route is automatically set up and the necessary motors started in correct order. A pressure switch in the conveying line from the test bins actuates a light on the panel when flour is flowing in the line.

An arrangement of solenoid-operated air valves is installed to prevent arcing of the flour in any of the bins. The bins are discharged by twin worm bin dischargers which feed the flour into intermediate hoppers.

**Batch Weighing Section**

The batch weighing bin is mounted on Elliott load cells and will weigh batches up to a maximum of 800 lb. Each batch can consist of various weights of up to seven different types of flour, automatically selected from the seven types or blends of flour in the main storage bins. The weight of each particular flour is pre-selected by punch cards and as soon as this selected weight is reached, a diverter valve prior to the weigh-bin is automatically switched over.

The weight of each particular flour is given on an indicator on the control panel and the recipes of batches required are selected automatically by means of a punch card system, which enables the oven operator to request a batch to the recipe of his particular oven, or it can be selected manually by the controller.

The weighed batches of flour are delivered to receivers mounted above the dough mixers located in two main mixing rooms. The correct distribution path for feeding weighed batch to a receiver is determined by the automatic programmer.

Delivery of batches to the dough mixers is either at the request of the oven operators or the operation of semi-random selection equipment, built into the programming unit. A local indicator informs the oven operator when a batch has been delivered and by pressing a discharge button, he delivers the batch to the mixer.

**Pre-Programmed System**

A recipe consists of a blend of any of seven grades of flour with the possible addition of milled and granulated sugar,

KEY—

QPM=ELECTRO PNEUMATIC SLIDE

OXM=TWIN WORM BIN DISCHARGERS

QNM=ROTARY BLOW LINE FEEDER

DV =DIVERTER VALVE

O DI=DIAPHRAGM INDICATOR

DC =DUST COLLECTOR

FR =FLOUR RECEIVER

=EXHAUST TO DUST COLLECTORS

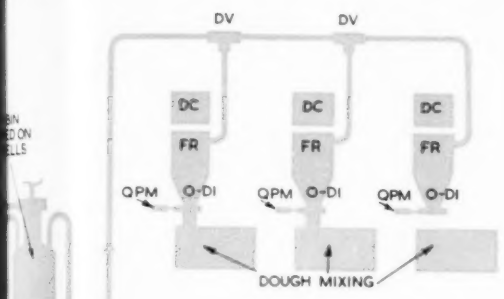


*Fig. 6. The intake hopper for sack deliveries incorporates a dust collector. Local controls are provided on the left*

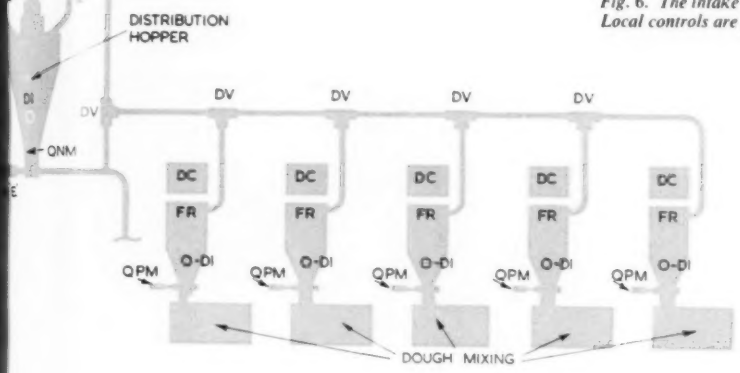
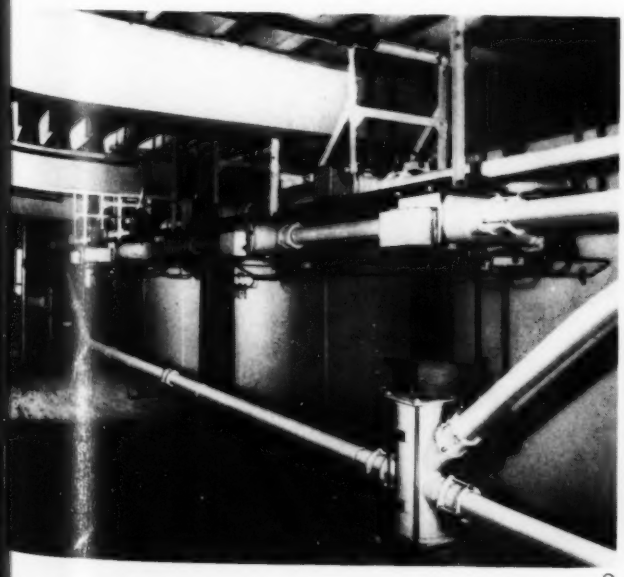
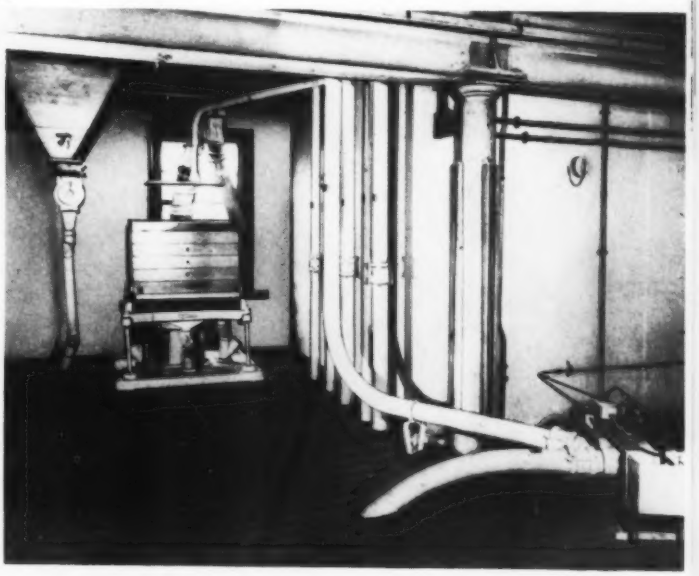



*Fig. 7. The return line to the main storage bins with the load cell weigher at the end of the section. Each diverter valve is automatically switched to the correct position to allow surplus flour in the line after each weighment to be automatically returned to the bin of origin*

*Fig. 8. The Minisifter on which flour is dressed before passing to the appropriate main storage bin. The hopper of the dust collector can be seen immediately on the left, and the pipeline in the foreground is the main conveying line carrying flour from the storage bins to the dough mixers. The diverter valve at this point operates to clear the line between deliveries*





fats, syrups, glucose and other ingredients are added during mixing.

Selection and control of recipes can be carried out in either of two ways, i.e. a manually programmed system and a pre-programmed system, using punched cards which gives fully automatic operation. Holes punched in each recipe card correspond to the weight of each ingredient required. Plugs inserted through each hole into corresponding holes in the programme panel interconnect two printed circuit matrices, so selecting the type and weight of ingredient required.

With the pre-programmed system where more than one mix has been requested at the same time, the programmer scans all the ovens in a predetermined order, until it finds one making a request. The weighing of this mix is completed and dispatched, before the hunting for another request is started. The programmer will omit any request from an oven whose containers already hold ingredients or have their discharge valves open. It will also reject a recipe requiring an ingredient that is not available.

A complete record of the ovens selected and the recipes supplied is given by a teleprinter of standard pattern. The control panel is housed in a dust-free room, the starters and subsidiary control equipment are grouped in a separate compartment at the rear of the panel. The panel is divided into appropriate sections, covering intake to test bins, transfer from test bins to storage bins, batch preparation and batch distribution.

Any fault on complete equipment will sound one or more alarms and a visual indication of the type of fault and its location will be displayed on the control panel.

Facilities have been built in to enable this fault condition to be 'piped' to the maintenance section or telephone

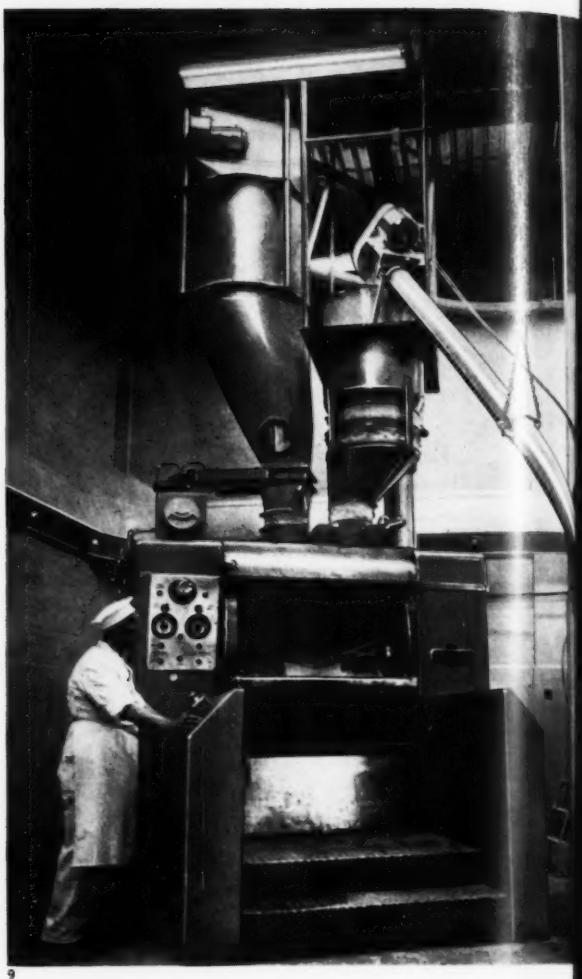


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*Fig. 9. A Baker Perkins high-speed tilting bowl mixer, which is fed with flour from the hopper on the left and with other ingredients from the sifter unit on the right. The air conditioning ducting can be seen above the tiled surround*

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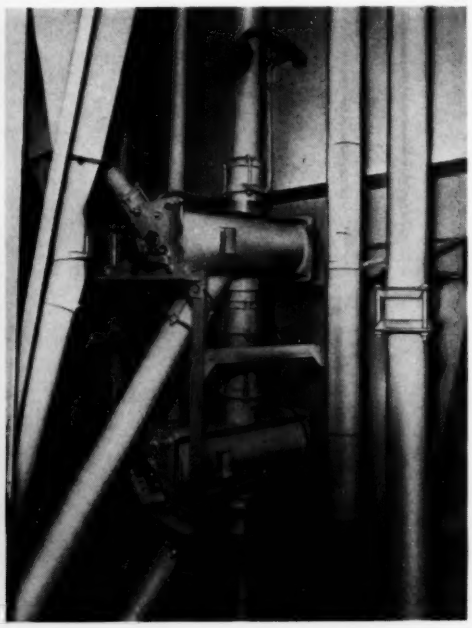

*Fig. 10. The compactness of the pneumatic conveying system is well illustrated here. The picture shows a diverter valve feeding a receiver which delivers batches of flour to the dough mixing plant*

*Fig. 11. A view of the main conveying line to the test bins, showing the diverter valves which control the routing of the flour from the three intake points. The pressure switch located immediately above the top diverter valve gives visual indication, both locally and on the main control panel that the line is in operation*

operator. The equipment is also equipped with a memory which will enable it to remember where it was previous to a fault, such as mains failure, and it will then carry on from its last operation. Under these conditions it is not necessary to have an operator in the control room all the time.

Some 30 English Electric motors have been installed in the plant ranging from ¾ to 25 h.p. All are controlled from the main panel, and sequencing prevents the consequence of human error during starting operations. Allen West control gear has been specially produced to meet the requirements of the circuitory.

The Tuyler flour bins combine the advantages of timber for flour storage, including high insulation and freedom from condensation, with the sturdiness of reinforced concrete frame-work. Steel hoppers are mounted beneath.

# HANDLING IN A SHIRT FACTORY

By H. G. Vallings, A.M.I.Mech.E.

GREATER efficiency has been achieved in the pressing and folding department of the Great Universal Stores Group shirt factory at Aylesham, Kent, by the installation of a *Movemaster* continuous overhead conveyor, Fig. 1. This conveyor, which is now manufactured by Baker Perkins, Ltd., carries shirts by their hangers from the pressers to the folders.

Previously the pressed shirts were laid over the rail of a trolley—like a clothes-horse on wheels—and wheeled to the folders. This system suffered from the disadvantage that any shirts left on the trolleys over a weekend had to be pressed again and if more than six shirts were placed on a rail, some of them had to be retouched with an iron. In addition, the trolleys occupied much valuable floor space.

*Fig. 1. Movemaster conveyor in space between the presses and the folders' tables. There are two presses, similar to those in the foreground, at the far end of the conveyor*

Now, as well as handling the shirts more efficiently, the overhead conveyor provides storage for about 20 dozen pressed shirts which maintain their freshly-ironed appearance when left on their hangers over a weekend.

**Pressing and Folding Processes**

A shirt is picked up from a pile on a nearby table and placed in an electrically heated triple-head press which presses the collar and cuffs in one operation, Fig. 2. After removing the shirt from the press the operator places it on a stand within reach of one of a team of three girls who serve the yoke and bosom press, Figs. 3 and 4. This machine presses the yoke of one shirt and the bosom of another at the same time. Thus a shirt has to be set up on the appropriate 'buck' or table for each operation and fed to the press twice. To reduce the cycle time, this machine has two sets of bucks mounted on a turntable so that a completely

*Fig. 2. Triple-head press for collar and cuffs*

pressed shirt can be withdrawn from the bosom buck and replaced by a shirt whose yoke has been pressed and another shirt loaded on to the yoke buck while two other shirts are being pressed. On being finally removed from this press, a hanger of special design is inserted, the buttons are fastened and the shirt is hung on the moving conveyor, Fig. 5.

The shirt continues moving until lifted off by one of the 12 folders, Figs. 6 and 7. The hangers are made of stainless steel wire, and their two arms bend easily so that they can be pulled out through the neck opening, Fig. 8. If a normal type of hanger were used, it would have to be withdrawn through the body of the buttoned shirt, which, apart from the time taken, would crush the garment. The folders work at tables equipped with an electrically heated expanding chuck which holds the shirt by the neck during the folding operations.

**The Movemaster Conveyor**

This overhead conveyor occupies the space between the two rows of folders' tables and the two sets of presses. It is 22 ft long × 2 ft wide, and is floor-mounted on two pedestals so that the circuit-rail is 4 ft high. Shirts on their hangers are carried on a terylene rope running at 35 ft/min. This rope is driven by an electric motor which is housed, together with the reduction gearing and rope-tensioning pulley, near the centre of the conveyor. The rope is supported on nylon wheels mounted on the circuit rail. At the four corners of the conveyor, star-shaped pulleys guide the rope without dislodging the hangers. At one point, guide pulleys are arranged so as to lead the rope from the circuit-rail to the driving and tensioning pulleys within the conveyor and back again to the circuit. As the rope leaves the circuit on a downward path, the hook of a hanger is automatically disengaged and allowed to slide down an inclined rail to the point where the rope returns to the circuit, Fig. 9. The whole machine is designed so that there is no likelihood of shirts being dirtied or of anyone's fingers being caught up in the moving parts, but as a precaution, emergency stop buttons are provided at both ends of the conveyor.

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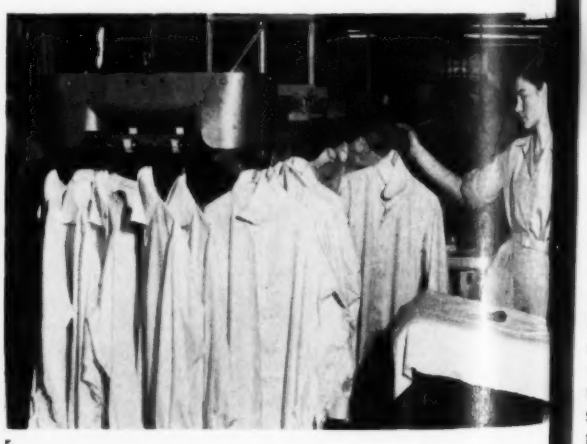

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*Fig. 3. After setting-up shirts on the bucks they are damped with a water-spray before pressing*

*Fig. 4. After pressing a hanger is inserted and the buttons are fastened. Control unit at left controls temperature of press to ± 5 deg*

*Fig. 5. Pressed shirts are hung on the moving conveyor*

6

9

8

*Fig. 6. One girl lifts a shirt off the conveyor while another completes the folding*

*Fig. 7. The neck of a shirt is held in an expanding chuck during folding. Finished shirts are stacked in a trolley and wheeled to inspection and packing department*

*Fig. 8. Special hanger is withdrawn through the neck opening*

*Fig. 9. Terylene conveyor rope leaves the circuit to pass over the driving pulley. Until the rope rejoins the circuit the hangers slide down an incline*

7

In addition to providing a solution to a handling problem in a restricted area and helping to improve the output of the folders, this conveyor can carry up to 240 pressed shirts as a buffer-stock between the output of the presses and the intake of the folders.

**Equipment**

Movemaster conveyor—Baker Perkins, Ltd.; Electrically heated presses and folding tables—Brown & Green, Ltd.

# CONVEYING IN THE FERTILIZER INDUSTRY

By William Seiler

THE programmes published by the governments of many countries include a local increase of agricultural products. Wide irrigation or drainage schemes are under study or already in execution. Every farmer or peasant is interested in improving the soil of his property. The chemical industry, in particular the fertilizer industry, has thus been developed considerably, as for example in Italy where various new factories have been built. To cover the increasing demand, existing factories have added new manufacturing sections. Also the less developed countries are making efforts in order to produce the requested quantity of fertilizers domestically.

Research studies have shown that the plants in question use, in principle, three elements, i.e. nitrogen, phosphorus and potash, the latter being of the most nutritious value. Based on this knowledge the chemical industry has developed products for increasing the growth of plants of all kinds. The deposits of the required raw material for producing fertilizers are spread out all over the world and are of sufficient quantity to last for generations. These are in particular rock-phosphate and potash. Pyrites are being used for producing sulphuric acid which is an additional substance in the production of fertilizer. Also Thomas-slag, which is a by-product of the steel works, is used as a component.

The most important stocks of rock-phosphate are to be found in Morocco, Tunisia, Transjordan, Israel, North America and Russia. The origins, apart from the chemical analysis, differ in the following features: colour, density being 70 to 110 lb/cu. ft., granulation and consequently also in the flowability. Potash is mined in depths between 1,200 and 3,500 ft below the surface.

The main producers are France, Germany, Israel, U.S.A., Spain and Russia. The mined potash-rock contains only about 10 to 20 per cent of real potash. Big installations are required to crush the potash-rock and to clean it. The really clean potash is crystallized afterwards, passes a dryer and is ready for direct use for fertilizing.

The chemical industry also produces mixtures of the different raw materials mentioned above. These products, being mainly sold under a trade mark of the particular maker, are generally known as 'superphosphate'. Variations depend on special compositions and treatments with sulphuric acid and salt.

Fertilizer raw material and finished products are bulk materials *par excellence*. The initial costs on the site of mining of the raw materials are generally low. Hence all

*Fig.* 1. *View of the high-speed thrower or 'trimmer'*

efforts have to be taken to keep down the price of the end-products in order to increase the purchase possibilities of the consumers. Besides the perfection of the manufacturing process great savings are possible in efficient transporting and conveying of the material. Automation should be applied wherever possible in order to bring down the number of operators and workers required. Special attention should be paid to the storage of the great yearly turnovers of materials. Important savings can also be achieved in speeding up operations for discharging ships and railway wagons. A well-planned flow of all materials through the complete manufacturing process can be of paramount importance for determining the selling prices of the products.

The machinery industry for conveyors has done considerable research work for developing machines which can comply with the requests of the users. New conveying systems have been invented and existing ones further developed. The application of new conveying systems made it possible to a certain extent to build the storage space and the factory buildings in a more efficient and more aesthetic way. Some examples described below will show the improvements. The principal materials to be conveyed, i.e. rock-phosphate and potash, are very dusty and hygroscopic. Therefore, conveying machines should be entirely closed. The following description shows various applications of chain conveyors which conform with the above-mentioned characteristics. The working principle is already widely known: an endless chain with welded-on flights runs in a trough of sheet metal. The drive is effected by a chain-wheel on a shaft which is connected to a gearmotor. The material is conveyed as a compact layer of a height of 5 to 15 in according to the size of the conveyor. The chain speed

*Fig. 3. Mechanically operated scoops for feeding discharge point*

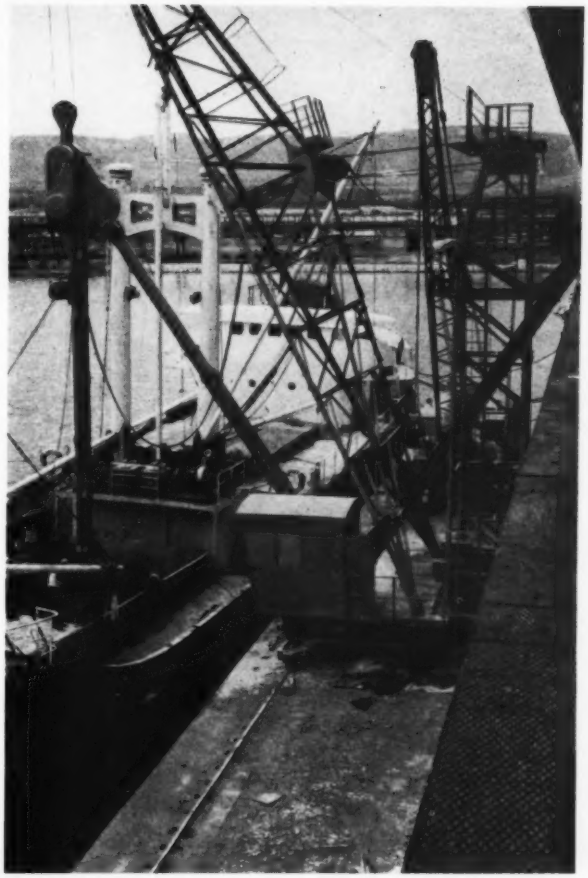
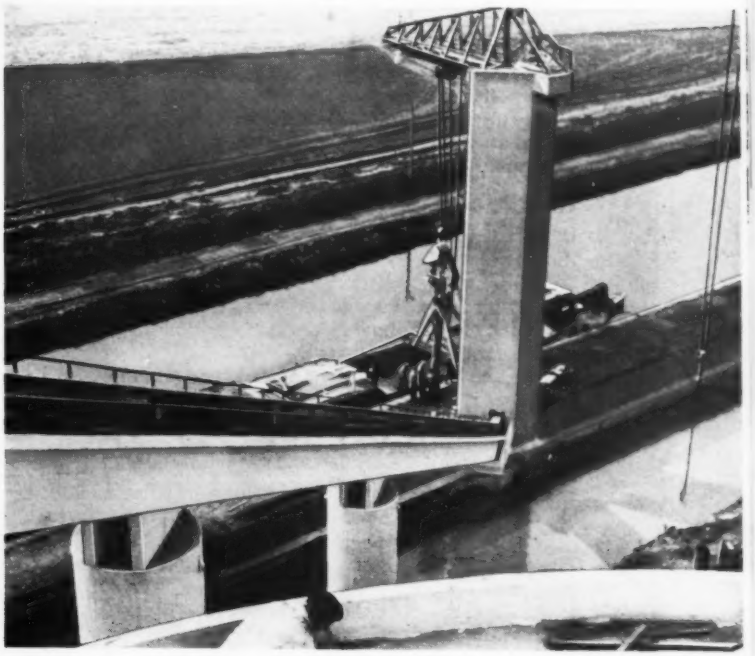


*Fig. 2. The ship chain conveyor is a self-supporting unit with built-in drive*

*Fig. 4. For feeding remainders to the ship chain conveyor electrically powered lightweight magnesium shovels are used*



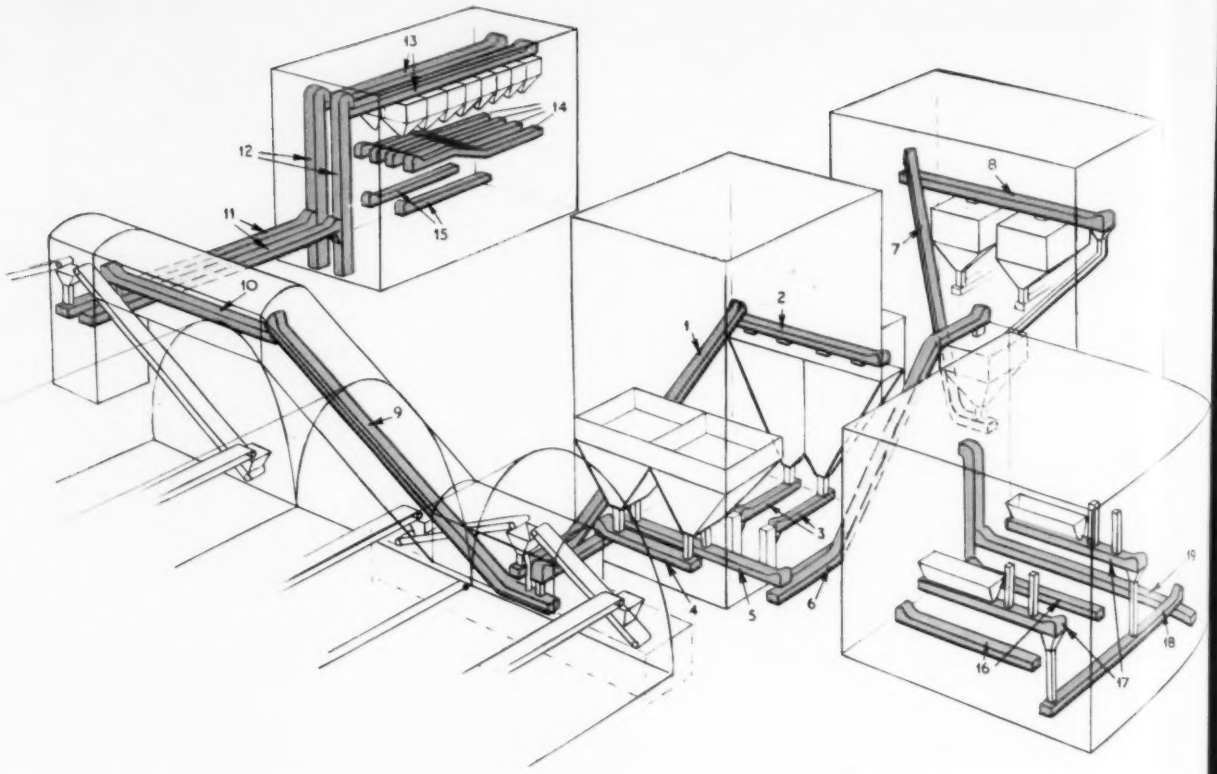



*Fig. 5. Schematic layout of conveying machinery in a new fertilizer plant in Italy*

varies from 20 to 300 ft/min depending on the abrasion of these materials and working hours per year. Units are made for horizontal and vertical conveying. The main advantages apart from absolute dustless conveying are small dimensions and a partly self-supporting construction. No maintenance is required on the full length of the conveyor.

A system of chain conveyors has been applied for a potash ship-loading plant in the harbour of Haifa, Israel. Inclined and horizontal conveyors convey the material from the storage shed to the quay. Two mobile structures with built-in chain conveyors are fed over telescopic pipes which can be placed at a distance of 20 ft apart, below the outlets of the quay distributing chain conveyors. The small gantries on the wharf are running on rubber-tyred wheels and can be moved by tractors. The inclined so-called ship chain conveyor can be adjusted in its angle of operation for loading the potash directly into the hold of the ship over an adjustable tube. Ships up to 10,000 tons can be charged with an hourly rate of 150 tons. The complete conveying operation is effected in completely closed units so that ship-loading is also possible when it rains. In such cases the hatch is covered with canvas sheets, only leaving an opening for the loading tube. The distribution of the potash over the hold is effected by a high-speed thrower, a so-called 'trimmer' (Fig. 1.) The above-mentioned ship chain conveyor represents a self-supporting unit with built-in drive. These units are specially used for ship unloading. Fig. 2 shows such an installation for discharging rock-phosphate in an Italian harbour. Due to shallow water, only boats up to 1,000 tons can be handled. The vertical conveying unit having a length of 40 ft is suspended at the boom of a travelling crane. The subsequent telescopic tube—consisting of four parts—leads the material to the inlet of an inclined chain conveyor placed on the crane structure. The unloaded phosphate with a capacity of 100 tons/hr is brought by means of belt conveyors to storage buildings at a distance of about 1,500 ft. The travelling crane makes it possible to unload the various holds without shifting the boat. In accordance with the flowability of the imported phosphate only part of the material runs freely into the intake foot of the unloader. The remainders have to be brought to the discharge point by means of mechanically operated scoops, Fig. 3. These power shovels are operated by a twin-winch fitted on to the conveyor below the driving head. Therefore, two scoops can be operated simultaneously ensuring a good average unloading rate. Alternatively it is possible to work on a fully automatic system by means of a drag-line bucket.

A similar installation is operating at a small harbour on a shipping canal in France. For suspending and supporting the chain conveyors preference was given to a very aesthetic concrete construction. In this way maintenance of this part of the plant could be reduced to a minimum. For starting the unloading operation the so-called SKT marine leg is dipped into the hold by means of a travelling electric wire rope hoist. This operation and starting of the motors for all conveyors is push-button remote controlled on a low voltage circuit. All conveying units are electrically interlocked. As soon as one chain conveyor falls out of service all preceding units will stop instantly. The reached unloading rate with this installation on boats with a load of 300 tons of rock-phosphate from Morocco was recorded with 80 tons/hr giving a discharge time of less than four hours. For feeding the remainders to the ship chain conveyor electrically powered lightweight magnesium shovels are applied (Fig. 4.)

Fig. 6 shows a modern silo installation for rock-phosphate in Italy. Each of the four bins has an inner diameter of

40 ft giving a storage capacity of about 3,000 tons. The storage building is fed from the ship discharger by an inclined chain conveyor visible on the picture on the right. The bucket elevator in the open tower lifts the phosphate to the horizontal distributing chain conveyor laying across the bins. This unit, having a length of 160 ft, is equipped with intermediate outlet slides for an alternative filling of the cells with a capacity of 150 tons/hr. Since chain conveyors can be made dust and water proof the covering gantry made of concrete could have been omitted. Intermediate outlet slides nowadays can be made push-button remote controlled by electro-pneumatic devices. For reclaiming the material from the bins each unit is equipped with a specially designed draw-off chain conveyor placed in a tunnel (Fig. 7.) The bottom of each cell is placed above this tunnel. The inside of this bottom can be provided with shiftings of about 40 deg so that the silo can be emptied automatically. For saving costs the bottom can be left flat whereby the flowing-out phosphate will form a remainder under its angle of repose. For regulating the flow of the reclaimed material special gates equipped with round bars have been developed. They are pulled out a few inches for opening. The draw-off chain conveyor is designed for dosing the required capacity automatically to 20 tons/hr. This picture also shows the easy way of supporting such conveyors. The four short reclaiming chain conveyors feed a similar unit of 330 ft length which is erected on small concrete supports. This machine lying direct on the ground level parallel to a parabolic storage shed feeds into an inclined chain conveyor working under an angle of 20 deg (Fig. 9). From there the rock-phosphate passes two other chain conveyors before joining the manufacturing process. This chosen example shows the simple and aesthetic way of application of this modern conveying machine.

The schematic layout of the conveying machinery in a new big fertilizer plant in Italy is shown in Fig. 5. Granulated and pulverized materials can be conveyed very economically by choosing direct connections between hoppers, silos and processing machines. This fact was possible in applying an all-chain conveyor installation with 27 units in operation. By conveying material out of intermediate hoppers the chain conveyor automatically regulates the flow to the chosen capacity. The universal application of this conveying system is demonstrated by the wide variety of products which can be conveyed with the same machines in a dust-proof manner. The units item 1 to 4 alternatively convey rock-phosphate and Thomas-slag while the machines item 9 to 13 are fed with four materials: potash, hyperphosphate, Thomas-slag and rock-phosphate. The conveying capacity of the different units varies between 4 and 75 tons/hr.

Factories for producing sulphuric acid also have problems which can be solved best by applying chain conveyors. After passing the process pyrites have to be cooled down from

*Fig. 6. Modern silo installation for rock-phosphate in Italy*

*Fig. 7. Draw-off chain conveyor in tunnel for reclaiming material from bins*

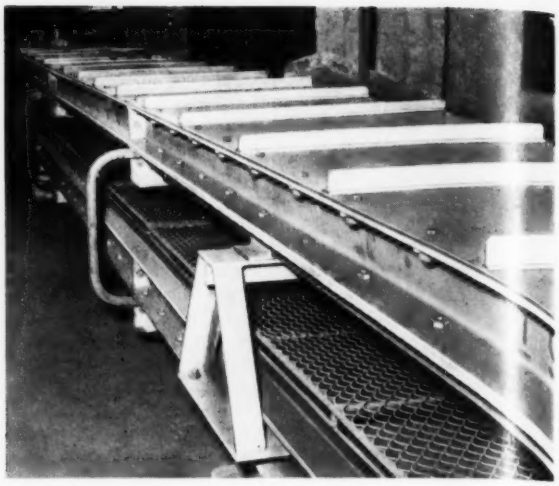


*Fig. 8. Special-type chain conveyor for cooling process*

temperatures of about 1,600 deg F to approximately 400 deg F. This lower temperature is required for binding the dust contents by water spraying without producing too much steam. Since the material should be conveyed simultaneously, special chain conveyors have been developed for this operation. In the scheme of the fertilizer factory shown above six such cooler-conveyors are installed.

Fig. 8 shows such a conveyor in detail. The unit is made of two separated casings for increasing the cooling effect. If necessary, water containers are welded on to the trough bottoms. Special care has to be taken regarding the proper design of supports and guiding brackets because of the heat extensions of all conveyor parts. Chain speed and width of the chain conveyors have to be adapted to the conveyed capacity and required cooling effect. The capacities of such conveyors built up to now vary between 2 and 15 tons/hr.

The examples given show the wide field of applications for chain conveyors in the fertilizer industry. The present processes of operation in such factories certainly have not reached its final stage. New problems will be put on to the machinery industry and will keep them searching for better and cheaper ways of conveying.

All the pictures in this article have been supplied by Buhler Brothers Uzwil, Switzerland.

*Fig. 9. Ground-level chain conveyor feeding a second chain conveyor inclined at 20 deg*

C. C. Richards, A.M.I.Mech.E.

# Traction Batteries for Battery Electric Handling and Transporting Equipment

*Some Recent Advances in Battery Design*

It is safe to say that the field of operation for industrial electrically driven mobile handling and transporting equipment would be enormously extended if the problem of feeding current to a mobile unit from existing power lines could be solved without the use of trailing cables, cable reels or bare conductors. Two solutions to this problem will be familiar to readers. Neither is without serious practical limitations.

The first and oldest method is the provision of a battery of lead-acid or nickel-iron alkaline cells, integral with each machine as the source of power, usually of sufficient capacity for a full working shift without recharging.

In the second method, which is of later origin, the function of the storage battery is taken over by a petrol or diesel-driven generating set, from which current is drawn as required for the motors driving the transmission machinery.

Familiar examples of this system are the diesel-electric mobile cranes pioneered by Ransomes & Rapier, Ltd., in 1924, the basic principle of which has since been widely adopted in various forms. Manufacturing costs of such machines are, however, high and the introduction of an internal combustion engine adds considerably to initial cost and subsequent maintenance charges.

The mechanical simplicity of battery-electric handling plant contributes to its well-known reliability and low maintenance charges. Quick acceleration, ease of control, silence and absence of exhaust fumes are in its favour. No power is consumed when at rest and starting is immediate at the turn of a switch.

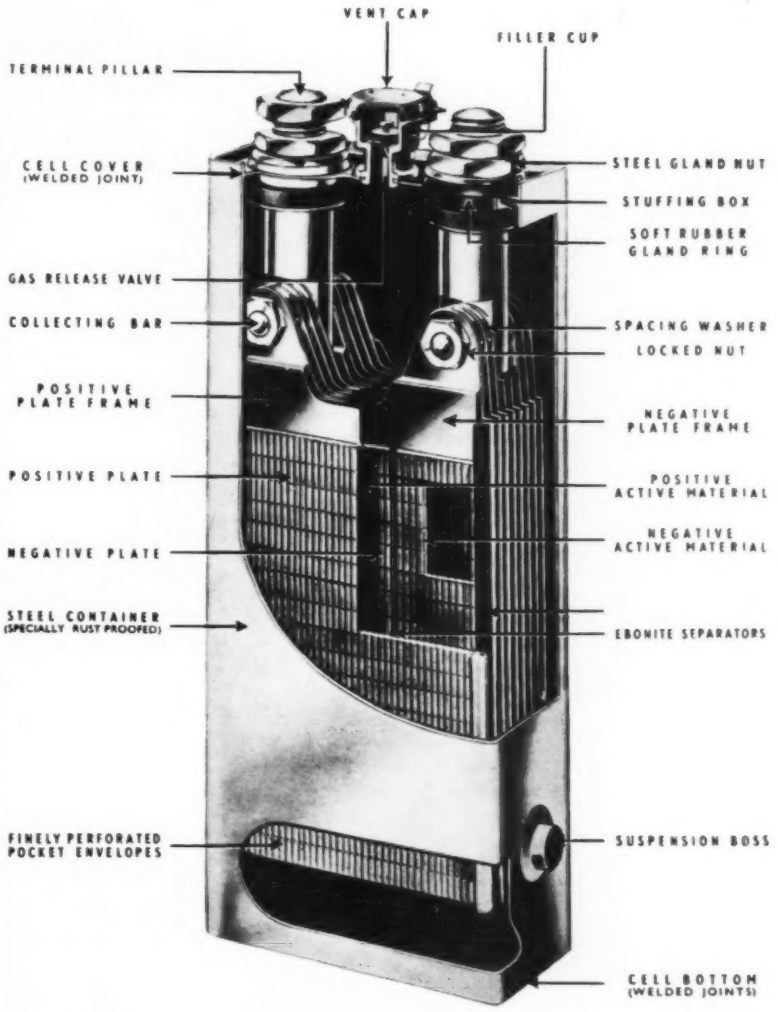



*Fig 1. Section showing construction of the Nife steel alkaline nickel cadmium battery*

For indoor work or in situations where inflammable materials are handled the battery-electric vehicle comes into its own.

When considering a scheme of materials handling by battery-electric units, it is well to bear in mind the fact that the elimination of deadweight, although a factor of major importance in the design of road vehicles or platform trucks, is not necessarily so in slower-moving machines such as mobile cranes, fork lift trucks and tower wagons where battery weight can be usefully employed to ensure stability under extreme conditions of loading, thus saving the expense of added ballast.

Similarly, tractive effort available at the drawbar of a mining locomotive or tractor is dependent upon adhesion between wheel and rail or road surface, which again is a function of wheel load. In such cases, the space in cubic feet occupied by the batteries is of more importance than their weight.

In the majority of traction applications, however, it is not so. On the contrary, every effort of the designer is directed

to the object of storing more electrical energy in a given volume and for a minimum weight.

At the present time, battery weight constitutes, on the average, approximately 23 per cent of the permissible gross laden weight of a commercial delivery vehicle. This ratio varies according to the type of vehicle and its equipment. The lowest value is 15 per cent and the highest about 30 per cent, calculated on the basis of lead-acid batteries.

The lightest traction batteries are those of the alkaline type but initial outlay is higher and the watt-hour efficiency lower than for the lead-acid type. The discharge voltage of the alkaline cell is 1·2 V against 1·9 V of the lead-acid cell. More cells are, therefore, needed for a given voltage. Vehicle makers will usually provide for either type, the choice being largely a matter of personal preference or experience.

**Basic Cell Types**

For modern industrial applications, two distinct types of storage batteries are in production. (*a*) The lead-acid type which utilizes the potential difference set up between plates of lead peroxide (Pb 02) and sponge lead (Pb) when immersed in a dilute solution of sulphuric acid. The voltage of a cell when fully charged is about 2·5 V and when discharged about 1·8 V.

When charged the anode or positive electrode has a reddish-brown colour. The cathode or negative electrode, whose active material is sponge lead, has a slate-grey appearance.

Lead-acid cells are in use for a very wide range of industrial applications. Their compactness, reliability, high power-to-weight ratio and competitive price, coupled with the fact that British manufacturers guarantee a useful life of four years during which free inspection service is available, have all contributed to establish a wide market for this type of battery. The effects of recent improvements on endurance and efficiency will be shown later.

(*b*) Steel alkaline cells are of two types, namely, nickel-cadmium and nickel-iron, differing mainly in the negative active materials used and the construction of the plates. For the positive plate of both types, the active material is nickel hydroxide while a mixture of cadmium and iron is used in the negative plate for the former and iron for the latter. The electrolyte in both types is a special solution of potassium hydroxide.

The use of cadmium in the negative plate of the nickel-cadmium cell is important. It has the two-fold effect of reducing the internal resistance and lowering the charging voltage. Conversely, this enables the cell to cope with peak loads without undue drop in voltage. Average voltage on discharge is 1·2 V per cell on the 5-hour rate.

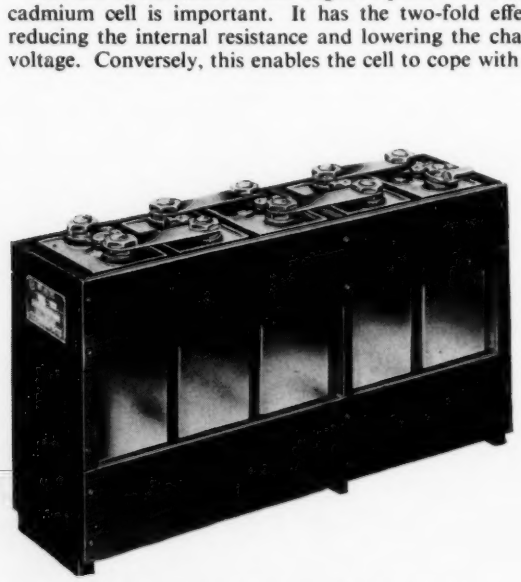


*Fig. 2. Nife 5-cell insulating crate containing five cells*

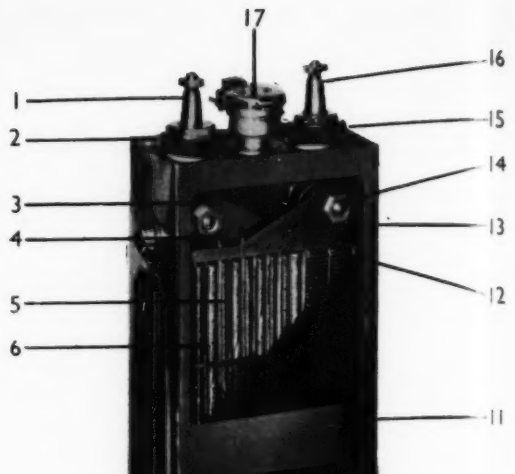



*Fig. 3. Britannia nickel-iron alkaline cell with tubular positive plate shown in part sections*

KEY

1. Positive terminal
2. Cell cover (welded joints)
3. Positive plate
4. Ebonite separators
5. Round steel tube containing positive active material
6. Seamless steel ring
7. Ebonite plate edge insulators
8. Steel suspension boss
9. Steel bottom (welded joints)
10. Ebonite plate side insulators
11. Solid steel container heavily nickel-plated and painted
12. Flat steel pocket containing negative active material
13. Negative plate
14. Steel connecting rod and nut
15. Liquid tight gland
16. Negative terminal

Alkaline batteries are widely used for industrial trucks, tractors, mining locomotives, etc., where their sturdy construction and endurance soon recoup initial outlay. Though more costly than lead-acid cells, they are light, simple to maintain or repair and reliable. For use in this country, they can be purchased with a guarantee of 8 to 10 years useful service. Open-circuit losses are negligible, periodic equalizing charges are not needed and low-rate charging when out of use unnecessary.

A brief review of a few examples of modern traction cells by well-known manufacturers may serve to underline available types and suggest future trends.

**Alkaline Traction Batteries**

The nickel-iron alkaline cell invented by Thomas A. Edison was introduced in 1909. It has survived many years of competition with the lead-acid cell, possessing features that render it suitable for many applications where lightness, combined with rugged strength and simplicity of maintenance, is essential.

The electrolyte is a dilute solution of potassium hydroxide. The positive plate consists of a series of perforated nickelled steel tubes, each containing alternate layers of nickel oxide and nickel flake.

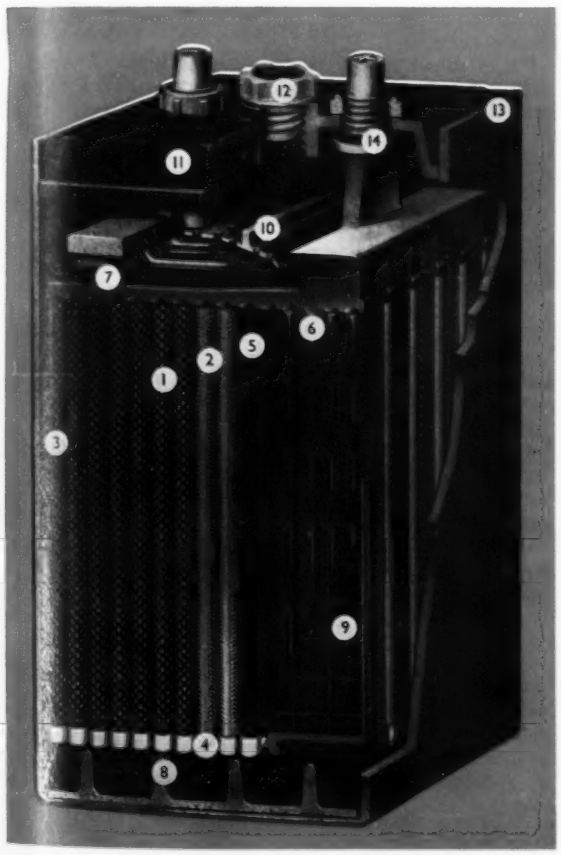
The negative plate is in the form of a number of nickelled steel pockets packed with finely divided iron oxide. The container and top assembly are of welded steel. Discharge voltage varies from 1·40 to 1·10 V on the 5-hour rate.

The NIFE nickel-cadmium alkaline battery, shown in Fig. , is made almost entirely of steel. The alkaline electrolyte is a preservative of steel, and as the cell is almost completely inert on open circuit, no deterioration occurs when a battery is idle.

Both positive and negative plates are built up with pockets of finely-perforated steel which totally envelop the active material. In the positive plate the active material is nickel hydroxide, while a mixture of cadmium and iron is used in the negative plate. The positive and negative plates are interleaved and insulated from each other by ebonite separators. The container is of heavy-gauge welded sheet steel, specially rust proofed. The combined vent and filler cup is of steel, welded to the container lid.

The electrolyte consists of a specially prepared solution of potassium hydrate with a small percentage of lithium hydrate. The specific gravity of the electrolyte remains constant throughout charge and discharge. Complete batteries of cells are held in insulating crates of seasoned hardwood, Fig. 2.

Owing to the fact that NIFE batteries readily absorb high charging currents, they are normally fully charged in as little as seven hours. No specific gravity or voltage readings need be taken during charging. No objectionable fumes are given off.



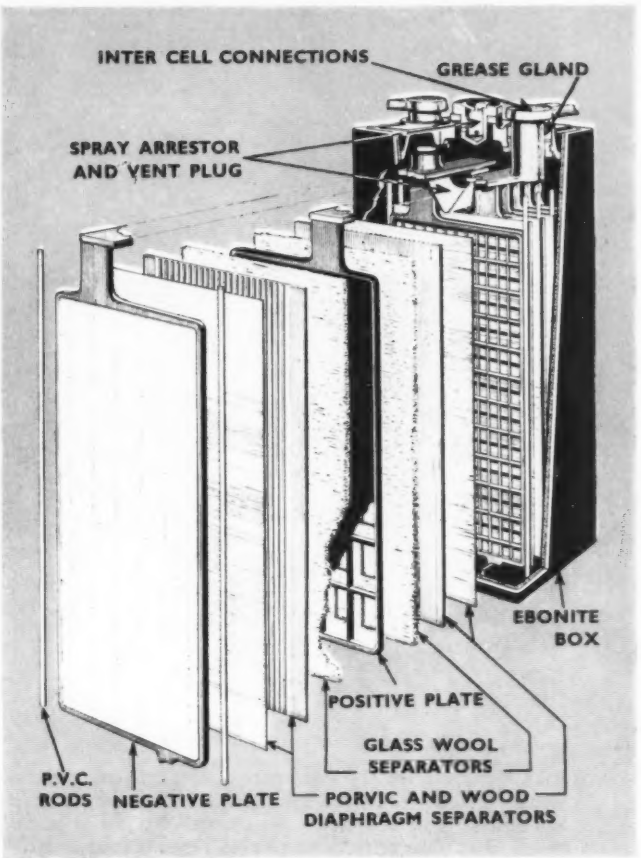




*Fig. 4. Exploded view of a D.P. Kathanode traction cell*

*Fig. 5 (Left). Oldham Pg double-sleeve multi-tube traction cell*

KEY—Fig. 5.
1. Perforated P.V.C. sleeve
2. Braided glass fibre inner sleeve
3. P.V.C. top protector
4. P.V.C. bottom protector
5. Positive active material
6. 'X' metal alloy spine
7. Microporous rubber separator
8. Supporting prisms
9. High performance negative plate
10. Acid baffle and separator shield
11. Robust ebonite lids with deep bitumen sealing trough
12. Double baffle non-spray vents
13. Terminal posts
14. Hard rubber (ebonite) container

The Britannia tubular positive plate nickel-iron battery shown in Fig. 3 is recommended for fork lift trucks and similar applications where floor area is limited but reasonable height available and where considerable ampere/hour capacity is needed. They are also widely used for battery locomotives in underground metalliferous mines all over the world. Nickel-iron batteries are particularly suited to such applications where high ambient temperatures are common and less skilled labour is available for operation and maintenance. This battery is guaranteed by the makers, Alkaline Batteries, Ltd., of Redditch, for 10 years, and it is not unusual for this period to be exceeded.

The positive plates are finely perforated steel tubes holding the nickel hydroxide active material. The negative plates consist of rectangular perforated steel pockets packed with a special iron oxide. The electrolyte is alkaline and

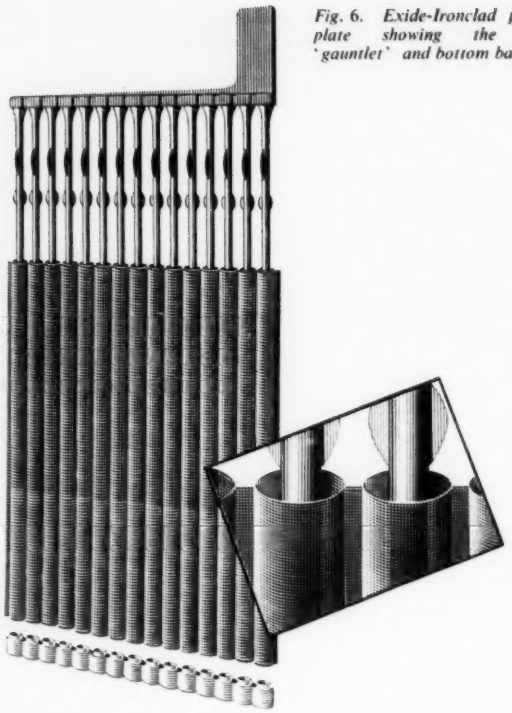


*Fig. 6. Exide-Ironclad positive plate showing the spine 'gauntlet' and bottom bar*

therefore preserves the steel parts. The cell container is heavily plated steel. The chemical action during charge and discharge is completely reversible. Oxygen is transferred from positive to negative plates through the electrolyte when discharging and the opposite happens on charge, the specific gravity remaining constant.

The average discharge voltage of the Britannia cell is approximately 1·20 V at normal discharge rates, and the charging voltage rises from 1·55 to 1·84 V at normal currents. Current output per lb of complete cell is from 14 to 16 watt-hours.

Maintenance consists merely of charging, topping up with distilled water and external cleaning. No damage will occur during standby periods provided that the plates are covered by the electrolyte.

**Lead-Acid Traction Batteries**

During the last decade, improvements in the design and construction of lead-acid traction batteries have been aided by developments in the field of plastics, resulting in greater stability and endurance of the positive plates, greater compactness, and, most important of all, a higher power-to-weight ratio.

Among the first to exploit successfully these new materials and to prove their reliability, was the D.P. Battery Co., Ltd., of Bakewell, Derbyshire. Fig. 4 shows the construction of the D.P. Kathanode 'N' range of high-capacity lead-acid traction cells designed in 1955 in anticipation of a demand for higher capacities.

This range incorporates patented features originated by the D.P. Battery Co., Ltd., over 40 years ago, such as the glass-wool separator on either side of the positive plate, reinforced by ribbed 'Porvic' and wood diaphragms. Vertically positioned p.v.c. rods at the edges of the negative plates prevent the formation of negative growth which might cause short circuits. The effect of glass wool in supporting and retaining the active material of the positive plates has enabled new grid designs using improved alloys to be developed, resulting in a substantial reduction of cell weight and greater durability.

The negative plate is designed specifically to balance the positive both as to capacity and life.

Under the severe conditions of traction duty, the life of a cell may be limited by loss of capacity resulting from high-acid density and high cell temperature. This cannot be avoided when the maximum capacity must be packed into the smallest possible space. To economize space the volume of electrolyte must be reduced and its density proportionately increased. The safe limit of acid density is 1·275 and for the same reason cells must be packed closely, which impedes heat radiation. As a result of prolonged laboratory tests, the D.P. Battery Co., Ltd., have developed a formula for a negative paste to resist the worst effects of heat and high-density acid.

Batteries of the Kathanode 'N' type as described were put into service in 1956. They are still in excellent condition and are expected to have a life at least as long as the standard range of cells which average nearly six years. Approximately 35 per cent more power output is claimed for a given space and weight.

**Tubular Plate Batteries**

For many years the efforts to stabilize the active material of the anode or positive plate led to the development of the 'bag' type of construction which consisted of slotted ebonite tubes formed to hold the lead spines and oxide. Later, replacement of the slotted ebonite sleeve of the tubular anode by newer plastics resulted in a considerable increase in the capacity and stability of the plates and better diffusion of the electrolyte.

Among the first of these new productions was the Pg. Battery introduced by the Swedish Tudor Company now technically associated with Oldham & Son, Ltd., in the production of the new Pg. range of multi-tube, double-sleeve traction batteries.

Fig. 5 shows clearly the positive plate assembly, consisting of a braided glass-fibre sleeve supported by a perforated p.v.c. outer tube. By this method of construction the woven sleeve retains effectively the positive active material while the perforated p.v.c. tube provides additional mechanical support. This enables the tube assembly to withstand the full expansion and contraction of the active

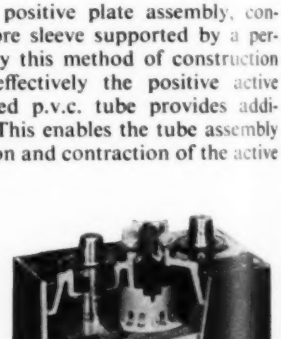


*Fig. 7. Part section through an Exide-Ironclad traction cell*

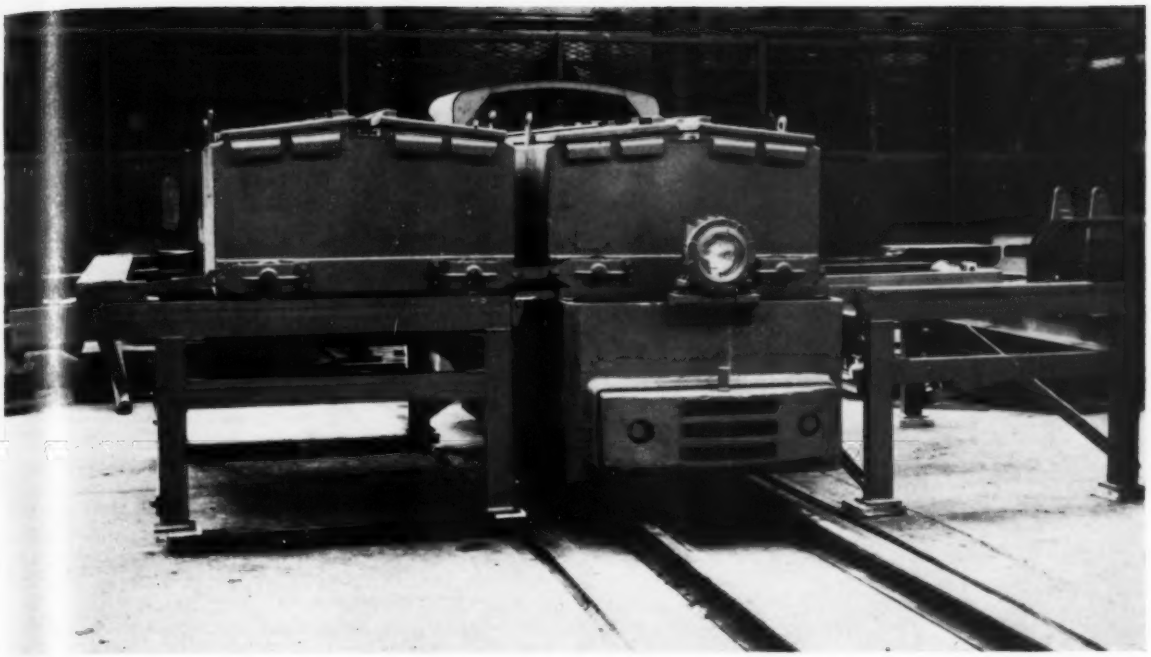


*Fig. 8. Battery changing tables for Greenwood & Batley locomotive*

material which is a function of the normal working of the cell. Shedding of active material is also reduced to a minimum. This method of construction permits a greater power output per unit than had hitherto been possible and by virtue of the strength imparted by the double insulation, i.e., glass braid and p.v.c., justifies expectation of an appreciably longer life. The use of half-perforated p.v.c. end tubes removes the hazard of internal short circuits.

Tubular formation of positive plates is a feature of the new Exide-Ironclad 'F' range of 'gauntlet' plate traction cells shown in Fig. 7 which possess the advantage of full interchangeability with present equipment of the same make.

The construction of the 'gauntlet' positive plate with C.B.95 alloy grid, one-piece woven terylene gauntlet and moulded polythene bottom seal are shown by Fig. 6.

Negative plates are shielded with microporous 'Porvic' sleeves to prevent internal short-circuits.

The woven terylene 'gauntlet' combines great tensile strength with elasticity, enabling it to accommodate the cyclic changes that occur in the active material. Consequently, shedding of active material is negligible and this has permitted a reduction of cell depth. The remarkable resistance of terylene to oxidation and corrosion by battery acid is enhanced by a resin coating. Cell containers are of moulded and toughened rubber, fitted with combined spray arrestor and separator guards of acid-resistant polystyrene. Approximately 35 per cent greater electrical capacity in the same space, greater durability and the highest possible output in watt-hours per unit of volume, are the outstanding qualities claimed for this new range of traction cells.

**Battery Charging**

Routine battery replenishment is usually from a metal rectifier charger which is fully automatic in action and needs no skilled attention. Chargers are obtainable suitable for any climatic conditions, mains voltage or frequency. A fully discharged battery can be charged to capacity in 8½-12 hours. Valuable advice on the choice of suitable charging equipment is obtainable from battery manufacturers.

If a vehicle is on shift work continuously, a spare set of batteries will be needed, with facilities for a rapid change-over from spent to fully charged crates of cells. Fig. 8 shows the method adopted by Greenwood and Batley for their mining locomotives. The 8-ton locomotive shown is of the approved type certified by the Ministry of Power for use in gaseous mines in any part of Great Britain. The standard battery equipment consists of 80 lead-acid cells, 50 kW/hr capacity, mounted in a ventilated steel container.

The locomotive is brought into position between a pair of steel changing tables. Battery containers are mounted on rollers for easy removal. A hand-operated winch pulls or pushes the discharged battery from the locomotive, simultaneously moving a fully charged battery into position. The discharged battery is left on one of the tables and is charged in that position, ready for a repetition of the operation.

The operation can be motorized to give speedier battery changing.

**Battery Use and Maintenance**

Like any other industrial tool, batteries need intelligent understanding of their capabilities and limitations if their full potential is to be realized under service conditions. In order to provide the fullest information, practical instruction manuals are available to every user. They deal clearly and explicitly with every possible contingency that might arise.

**Effects of Increased Battery Capacity**

Since it is now possible to pack into the same space and for appreciably less weight, a battery of approximately 35 per cent greater effective capacity, existing vehicles or machines will, when fitted with the improved types of battery, work for correspondingly longer periods between charges.

The greatest benefit will be manifest where shift duty is in operation as in coal or metalliferous mines, for inter-works transport by platform trucks, tractors, fork lift or crane

*Fig. 9. Ransomes NR.50 fork lift truck*

trucks. Operating time lost on account of boosting charges will be appreciably reduced.

Fig. 9 shows a typical example of a works transport vehicle in the form of a fork lift truck. This vehicle is equipped with a battery of 640 amp/hr capacity at the 6-hour rate (23 kW/hr).

It is estimated that light delivery vans of the type shown by Fig. 10, equipped for a range of 35 to 40 miles/charge, can now be operated on rounds extending to 50 or 60 miles/charge without increase in cost. Batteries for the 1-ton and 30-cwt vans are of 226 and 258 amp/hr capacity respectively (at the 5-hour rate) housed in two crates, easily and quickly removable.

**Effect on Design of New Machines**

The effect on the design of new machines is less easy to predict. Three courses are open to the designer. He can offer (*a*) increased payload, (*b*) increased range, i.e., mileage per charge or cycles of operation per charge, or (*c*) increased speed, including livelier performance.

With a total energy bonus of 35 per cent to expend, it is obviously important to choose carefully which course to pursue and this can be done only by a detailed examination of the duty cycle and a study of the forces and stresses imposed by the proposed additional loads or speeds.

To increase payload might involve additional weight of structure and machinery that could easily cancel out much of the advantage gained by the additional power available. The operating speeds of most vehicles and machines of the types under consideration have been standardized from long experience of working conditions in many industries. It will therefore be more advantageous to adopt course (*b*) and lengthen the working period between charges, rather than design for greater speed, or payload.

This applies particularly to the travelling motions of trucks and tractors operating on road surfaces that are none too smooth. The kinetic energy consumed in accelerating from rest is proportional to the square of the speed. If, therefore, the maximum speed of a vehicle is increased from 5 to 10 m.p.h., it would increase the power taken from the battery four times.

**Pending Developments. Bacon Fuel Cell**

Direct, one-stage conversion of chemical energy into electrical power has intrigued scientists ever since the idea was conceived and its possibilities proved experimentally by Sir William Grove in 1839.

Today, through the efforts of a team of workers under the direction of F. T. Bacon, M.A., A.M.I.Mech.E., sponsored by the National Research Development Association and in part by the Admiralty, the hydrogen-oxygen fuel cell has taken practical shape. The Bacon fuel cell is an electro-chemical battery consisting of 40 hydrogen-oxygen cells, together capable of a current output of 2·5 kW at 32 V potential or 5 kW at 24 V at maximum load. Charging consists merely of replenishing with the two gases—a simple and rapid operation. The only exhaust is water. The process is vibrationless and silent. Output control is entirely automatic. Efficiencies up to 80 per cent have been attained.

By utilizing the latest methods of storing hydrogen and oxygen, it seems probable that these cells could be used to propel trains, buses, heavy transport, aircraft and many forms of mobile machinery. It is, however, considered improbable that the fuel cell will compete with conventional types of batteries of sizes less than 100 W output, owing to the high cost of control gear in relation to the overall cost of an installation.

The U.S.A. have already manufactured units under licence from the N.R.D.C. for the U.S. Air Force.

The Allis-Chalmers experimental fuel-cell tractor recently unveiled in experimental form uses chemical energy produced by a mixture of gases which react in an electrolyte to provide controlled electrical energy for tractor-mounted electric driving motors.

It is possible that the cell activation gases could be produced during off-peak hours by the National generator facilities.

It was also recently announced by The Chloride Electrical Storage Co., Ltd., that development work on fuel cells to the extent of low pressure/low temperature systems of various types is being carried out at their new Clifton Junction Research Laboratories.

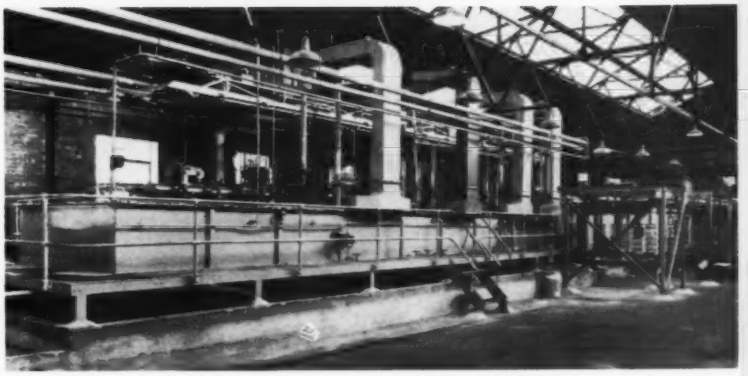
*Fig. 10. Smith's NCB electric 1-ton delivery van*

# AUTOMATIC LOADING AND UNLOADING FOR BRIGHT CADMIUM PLATING PLANT

BEFORE the war, Metal Colours, Ltd., of Slough, specialized in the manufacture of lead pigments and during the war made white lead for government purposes. A request to explore a heat treatment problem in the field of aviation then led to the setting up of a heat treatment shop which processed very large quantities of high-pressure coupling rings for aircraft and other military uses. Immediately after the war, a requirement arose for the cadmium plating of some 2 to 3 tons of coupling parts a day, and the firm therefore installed suitable electroplating plant for this work. Since then, the range of plating processes carried out has widened very considerably and now includes zinc, cadmium, nickel, chromium, brass, tin, gold and copper.

Owing to the very large quantity of plated components that the firm was handling, a decision was taken to install an automatic plating plant for bright cadmium, as this was at that time the firm's largest requirement. A two-row EFCO-Udylite Senior fully automatic plating plant, Figs. 1 and 2, incorporating an automatic loader and unloader, Fig. 3, has therefore been built and installed at the firm's Slough works by the Electro-Chemical Engineering Co., Ltd. This automatic machine processes 100 racks an hour or about 56 lb of components a minute, about half the components being threaded couplings and the remainder being radio chassis, parts for hand tools, agricultural implement components, etc. The plant, which is 43 ft long, is fully AID approved and normal production is to DTD 904.

The first stage in the process is for the components to be placed on jigs, Fig. 4, which move on a continuous overhead chain conveyor, supplied by S. Stott & Co., Ltd. The movement of this conveyor is synchronized with the loading and unloading of the automatic plating plant, so that as a loaded jig reaches a position next to a loading station a section of the conveyor track carrying the jig is moved automatically towards the plant. The next transfer movement of the plant pushes the carrier on to the plating track: this carrier is replaced at the same time by an arm carrying parts that have been plated, which on the return movement of the transfer system is moved back to the overhead conveyor to be unloaded. It will be seen that part



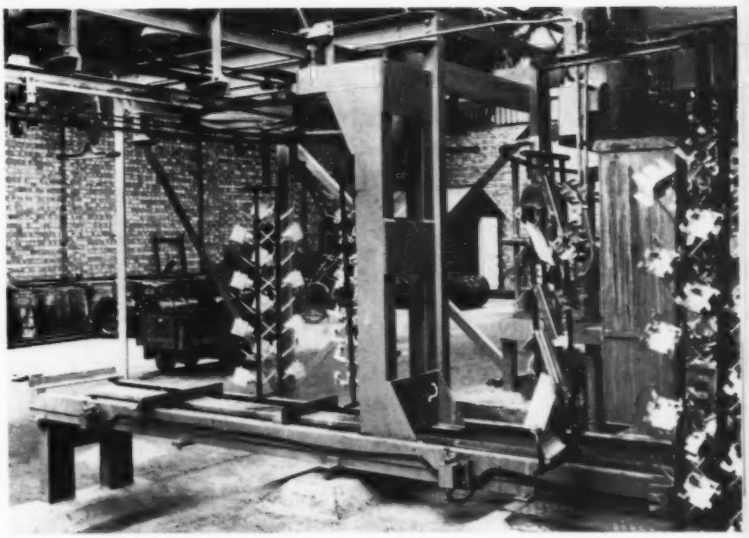
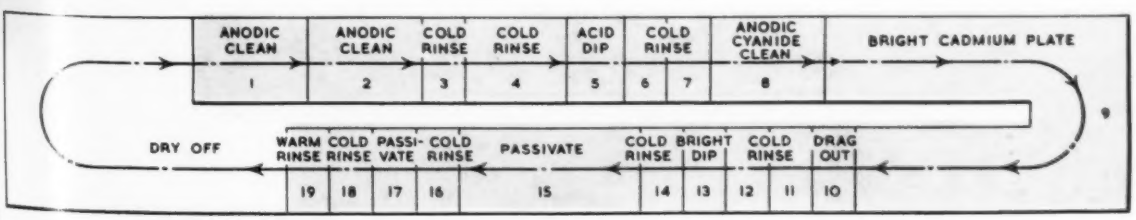


*Fig. 1 (Top). General view of the Efco-Udylite Senior automatic bright cadmium plating plant that has been installed at the Slough works of Metal Colours, Ltd.*

*Fig. 3 (Above). This automatic loader and unloader removes each jig of components from the continuous overhead chain conveyor on the left and transfers it to the plating track on the right: on the return movement, a jig of plated components is moved back to the overhead conveyor to be unloaded*

*Fig. 2 (Below). Plan of the automatic plating plant*



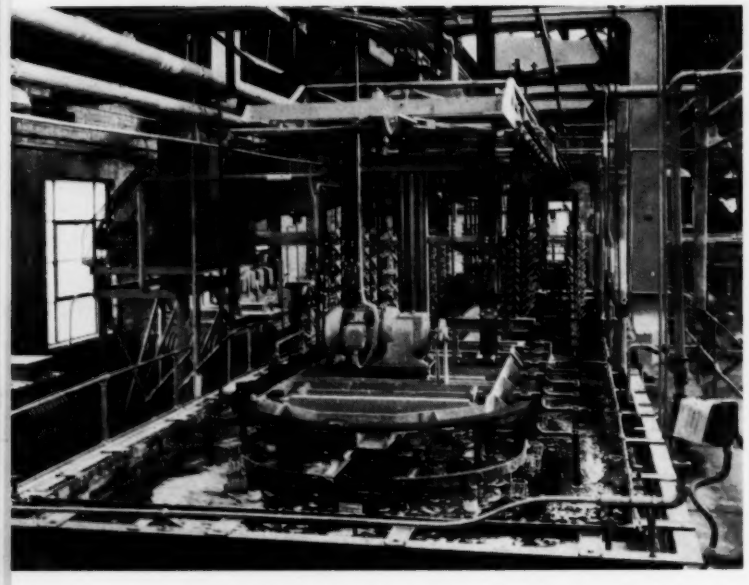


*Fig. 5. Bright cadmium plating stage of the automatic plant*

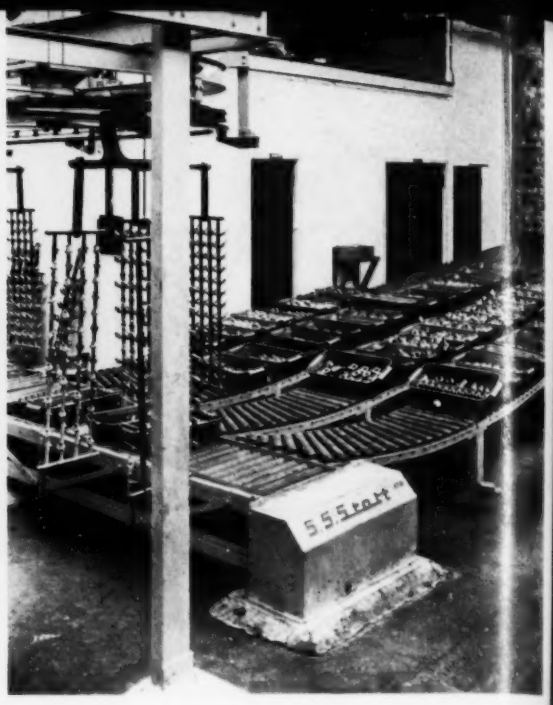


*Fig. 4. Roller conveyors bring the parts for treatment to the loading station*

of the track is common to conveyor and automatic plant.

As the loaded jigs move round the plating plant, Fig. 5, they are automatically lowered into process tanks in succession and lifted out again after the correct interval of time. The process stages include five cleaning steps, bright cadmium plating, rinsing and passivation to DTD 904 or 923; where DTD 923 passivation is carried out, the time of immersion in this tank can be varied to suit the degree of passivation required without affecting the dwell time of the work carriers in the other process tanks. Finally the work is dried. The automatic unloader then removes the jigs from the plant and the components are tipped into baskets, Fig. 6, which pass along a roller conveyor into an adjoining department for dipping, if required, in a solution of lanolin in white spirit to DTD 121D for giving additional corrosion protection to the interiors of the components.

*Fig. 6. Unloading plated components*

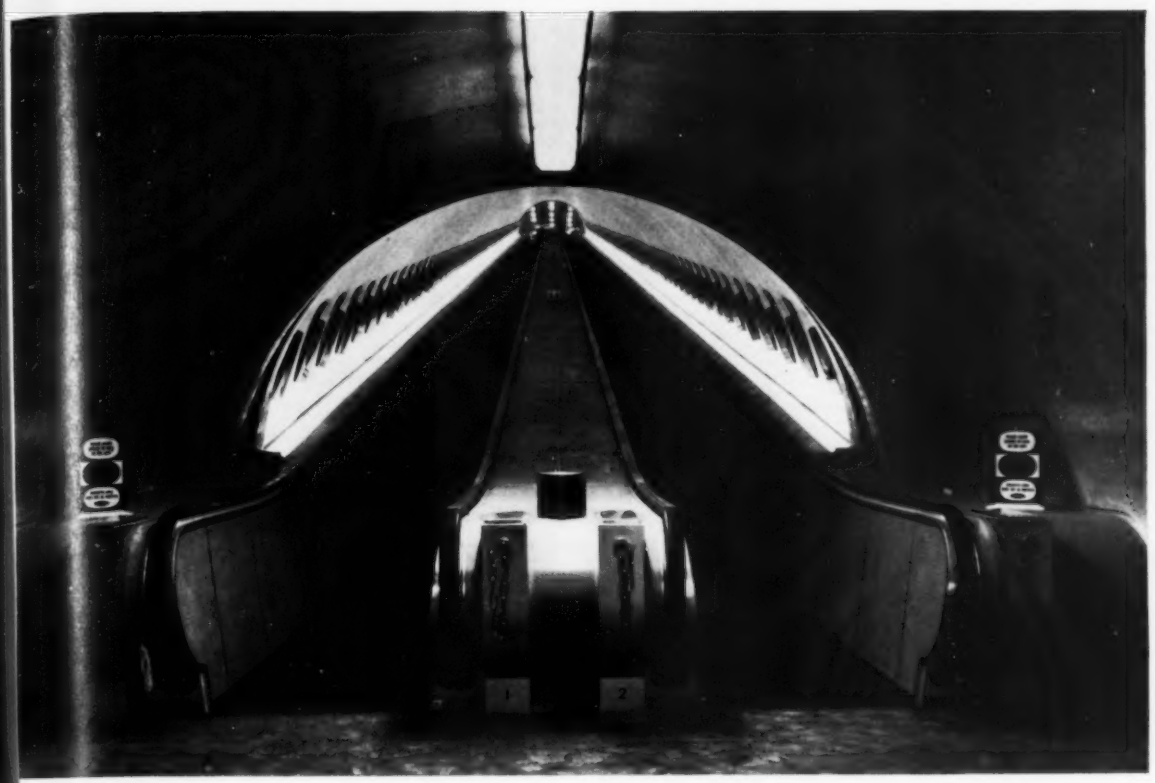


*Fig. 1. A view of the two-track Trav-o-lator from platform level*

# LONDON'S MOVING PAVEMENT

As mentioned in our November issue Europe's first moving pavement, the Trav-o-lator, is now in full operation at Bank underground station in the City of London, connecting with British Railways Southern Region Waterloo and City Line.

Acute passenger traffic congestion had been caused at peak hours due to the fact that the only exit was up a 1 in 7·4 incline of a 340-ft long, 13-ft wide subway, assisted by five steps at 40 ft intervals which reduced the gradient to 1 in 14.

Long before the war it became obvious that this was not a sufficiently effective way of clearing the rush hour crowds. The war and post-war capital expenditure restrictions held back the implementation of the first scheme to eliminate this long climb, a three-way escalator for which parliamentary powers had been obtained in 1939.

When in 1955 the Southern Region was able to tackle this long-standing problem it engaged a firm of consulting engineers to approach the matter afresh. It was during the development of the scheme which they prepared, largely following the pre-war plan, that it became apparent that something similar to what the Americans call a 'speed walk' would be cheaper and quicker to install.

The plan finally settled on to install two Otis Elevator Company Trav-o-lators was also based on certain further advantages over the original scheme: it would carry the passengers further than could escalators; the existing subway could be retained, and construction would involve far less interference either to passengers or to the existing drainage and services.

The version of the Trav-o-lators developed in this country for this scheme is based on the Otis escalators used by the London Transport Executive. At their maximum speed of 180 ft/min each can carry 10,000 people an hour up an incline of 1 in 7.

To clear passengers as quickly as possible both tracks run upwards during the morning rush, when the few passengers going against the tide walk downhill through the redecorated old subway. One track runs up and the other down during the rest of the day, including the evening rush. This spares passengers, particularly the elderly and infirm, normally having to do a long uphill walk. The period when they both run upwards is from 8.30 a.m. to 10 a.m. for the time being—although the arrangements may be altered as the result of experience.

The Trav-o-lator has taken three years to build—although work was slowed down for seven months in 1958 by the capital expenditure restrictions. It involved boring a

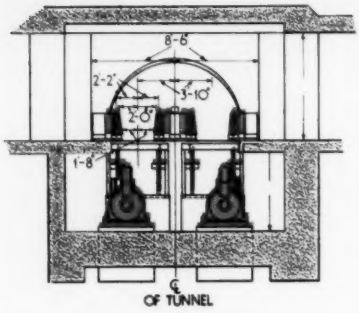
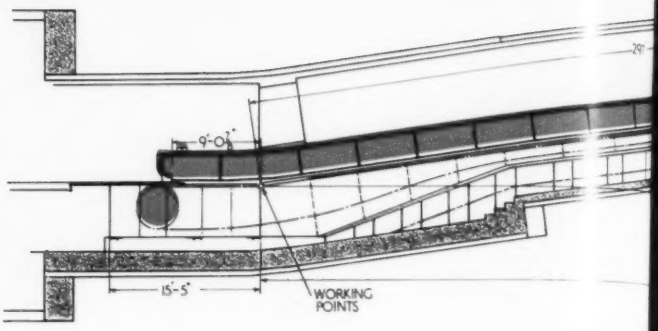



*Fig. 2. Section through tunnel at top of Trav-o-lator looking towards machine room*




tunnel 334 ft long and mostly 16½ ft dia, diverting a maze of giant sewers, large mains and cables, carrying out other extensive works below the surface of one of the world's busiest street junctions. Small teams of men had to work in cramped spaces, fitting in their jobs with the train service which carries over 40,000 City workers a day.

Because of this, much of the work had to be done at night, when special 'ghost trains' ran to Waterloo carrying some of the earth excavated from the site. Other jobs, such as diverting the mains and cables and building the roof of the new booking hall, could only be tackled from the surface. Again, they were done at night; during the day the workmen's trenches were decked over with temporary steel decking so that the City traffic could pass overhead. But pneumatic drills could not be used after 11 p.m., and on some nights when functions were being held at the adjoining Mansion House the work came to a standstill.

*Fig. 3. The circulating area at platform level*

The two Trav-o-lators, although similar in principle to the American 'speed walks', are the first of their particular type in the world: they are designed to heavy-duty requirements to carry large numbers of passengers ascending and descending. Every weekday 42,000 passengers will be using them, a very large number concentrated into the rush hours.

The main feature of the Trav-o-lators is that they utilize a continuous flat platform or 'travel-strip' travelling at a lower angle of incline as compared with the articulated step formation of an escalator which is normally 30 deg.

The Bank installation has an incline angle of 8 deg 07′ 48″ or 1 in 7, the length of the incline portion being 297 ft with a vertical rise 42 ft. The overall length including the horizontal portions at the upper and lower landings available for passenger loading is just over 312 ft and it is 40 in wide, which tapers out to 48 in at a point just below the handrails.

The maximum linear speed is 180 ft/min (2·04 miles/hr) and capable of adjustment for passenger traffic down to a speed of 90 ft/min (1·02 miles/hr). In addition a 'crawl' or what is termed an 'inching' speed of about 36 ft/min is available for inspection and other maintenance purposes.

Each Trav-o-lator has its own drive unit located in a motor room beneath the upper landing and consists of a worm-geared machine, electro-magnetic brake and variable speed 3-phase commutator motor of 85 h.p.

The worm gear is of high efficiency with multi-start worm which is connected to the motor shaft by a large diameter coupling which also forms a brake drum, the brake being spring applied and magnetically released. The brake is designed to stop the Trav-o-lator smoothly under all conditions of load and speed. The motor is continuously rated and of the Schrage type with pilot-motor operated brush gear.

Starting and stopping of each Trav-o-lator and its motor is performed through an individual automatic magnetically operated control gear of the contactor type mounted in a steel cubicle with hinged doors at the front. The control gear is designed to start and run its Trav-o-lator in either an ascending or descending direction at maximum speed or an intermediate speed down to 90 ft/min for passenger traffic and the 'crawl' speed previously referred to.

In addition to usual starting contactors, overload devices, etc., each controller embodies switches for operating the 'service' brake on the drive machine and the pilot motor

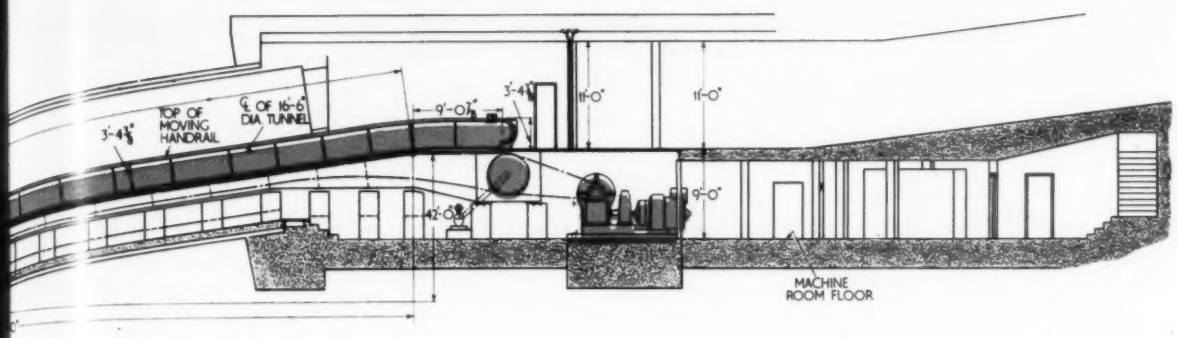



*Fig. 4. Side elevation of the complete installation*

controlling the main motor brush gear.

All magnets operate from a D.C. supply obtained from a rectified A.C. supply. Up-down buttons are provided for local control of each Trav-o-lator.

Five emergency switches are provided on the balustrade deck panelling between the two Trav-o-lators. One switch is located at each of the upper and lower landings and the other three switches are suitably spaced on the incline. There is also a key-operated up-down and stop switch at both upper and lower landings.

An automatic device actuated by a selenium cell is incorporated in the design which limits the 'travel-strip' speed to 90 ft/min after a predetermined time during which no passengers are being carried.

Over-riding control consists of switches mounted at the lower landing and on the station platform which reduce speed to 90 ft/min in the descending direction if required should the station platform become congested with passengers. These controls are independent of the operation of the selenium cell device.

**Construction of Platforms**

Each Trav-o-lator strip consists of 488 individual platforms, each 40 × 16 in, surfaced with special quality aluminium with close-spaced cleats embodying a feature to avoid a continuous gap between adjacent platforms. Each rides on four ball bearing wheels of phenolic and canvas materials. The platform wheels run on tracks which form the contour of the Trav-o-lator and are designed to confine side movement within narrow limits. The platforms are connected together and driven by two roller chains manufactured to very fine tolerances: the chains are assembled in matched lengths. At each end of the Trav-o-lators the close-cleated platforms pass through a comb plate to ensure comfortable movement on and off.

Just beyond the toothed combs, an important safety feature, and beneath the fixed floors are located pairs of sprocket wheels over which the chains pass. These sprockets are carried on substantial shafts running on roller bearings. The one at the upper landing end receives the drive from the motor and its reduction gear through the medium of a duplex roller chain and associated sprockets. It also carries the emergency brake of disc type, the function of which is to bring the Trav-o-lator to rest in the event of breakage of the drive chain.

The pair of sprockets at the lower landing end are mounted in a horizontally movable frame carried on rollers and fitted with a device for the purpose of maintaining the correct tension on the step chains and ensuring proper engagement between them and the teeth of their sprocket wheels.

Each Trav-o-lator is provided with two moving handrails constructed of cotton duck and rubber with a continuous steel tape designed to reduce stretch to a minimum. The handrails are separately driven at the upper landing newel wheel from the main drive shaft by means of a single roller chain. At the lower landing the drive of each handrail is by two driven wheels, the newel wheel and the intermediate wheel, the former being driven by a separate chain from the intermediate wheel sprocket. Each handrail is provided with a tensioning device at the lower landing, to ensure adequate adjustment and tension under varying conditions of loading.

The tracks or guides on which the handrails run on the passenger side are of bright drawn steel of special section to minimize undue friction and wear.

The handrails on the return side are supported at suitable intervals by means of a series of ball bearing phenolic rollers arranged in an arc and mounted in supporting steel framework attached to the balustrade supports and each series of rollers is provided with suitable device for obtaining the appropriate initial handrail adjustment.

Each 'travel-strip' is designed for intensive service with an adequate factor of safety based on a working load of two passengers or 300 lb every 4·45 sq. ft. of the overall area available for passenger loading.

The Trav-o-lators are carried by individual main frames of structural steel which in turn are supported on substantial concrete foundations extending the whole length of the incline and horizontal portions, the framing at the upper and lower landings also serving to carry a portion of the adjacent floor.

**Safety Devices**

Various safety devices are installed including a centrifugal type of excess speed governor, broken chain devices and broken handrail switches. Warning light indicators are located in the machine room to give visible indication when the broken chain devices are nearing a point when they will operate.

At each landing has been provided a series of floor plates over the Trav-o-lator trusses. These plates are in the form of trays of steel construction with bronze edging and filled with black rubber tiling. Beyond these floor plates has been

*Fig. 5. Passengers arriving at the top of the 334-ft long tunnel*

*Fig. 6. The platform layout of the City Line railway has been modernized to link with the Trav-o-lator*

provided a series of floor covers of somewhat similar construction. Floor plates and floor covers are removable to permit the taking out, if found necessary, of any large parts from the machine room.

An electric fan in the machine room passes air through the Trav-o-lator pit for cooling purposes and normally discharges it at ceiling level in the ticket hall. The direction of the flow can, however, be reversed.

The Trav-o-lator tunnel has a false ceiling of Celactite corrugated waterproof lining to which is attached an inner lining of Stelvetite sheeting. The side walls at the foot of the Trav-o-lator have a blue grey mosaic vitreous glass finish.

On each side of the 'travel strip' there is a shallow skirting with flat sloping panels above. There is deck panelling between each Trav-o-lator and between the tunnel side walls of the Trav-o-lators, of double armoured plywood, *Armourply*, with aluminium on the visible side and galvanized sheet steel on the reverse. The panels are faced with a grey coloured plastic.

The scheme was developed and the whole of the work designed and carried out by Mott Hay and Anderson, the consulting engineers, under the general direction of the chief civil engineer of the Southern Region, British Railways. The contractors for the tunnelling and general engineering work were Mitchell Brothers, Sons & Co., Ltd., and the contractor for the supply and installation of the Trav-o-lator was the Otis Elevator Company. The electrical equipment, including the motors and control gear, was manufactured and installed by Associated Electrical Industries (Rugby), Ltd.

# GIANT BALL BEARINGS FOR DOCKSIDE CRANES

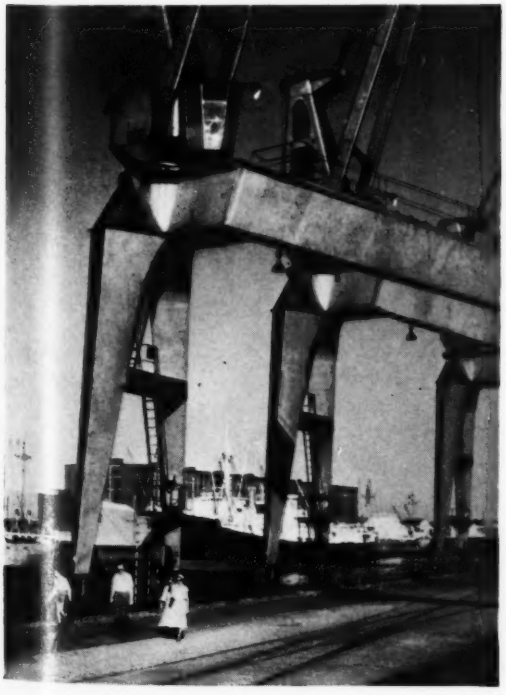
By Henry L. Lloyd, O.B.E., M.C., B.A.(Cantab)*

BALL bearing slewing rings have been used successfully in mobile cranes and tower cranes for several years. This article examines the reasons why these slew units are now being chosen for installation in new designs of high pedestal and portal cranes.

Essentially, the slew unit for a dockside crane rated to lift 5 ton at 80 ft radius consists of a double-row angular contact ball bearing, about 80 in in diameter, and weighing just over a ton. The rings, which are in three parts, are forged from a medium carbon steel, enabling the ball races to be flame-hardened to a minimum Brinell 500, and at the same time permitting teeth of good quality to be machined directly into the bearing ring.

This type of slew bearing is able to transmit high axial forces, radial forces, and tilting moments in a single compact unit. It is mounted by bolting to flange supports on the portal and on the revolving structure.

*Fig. 1. Demag dockside cranes at Bremen*



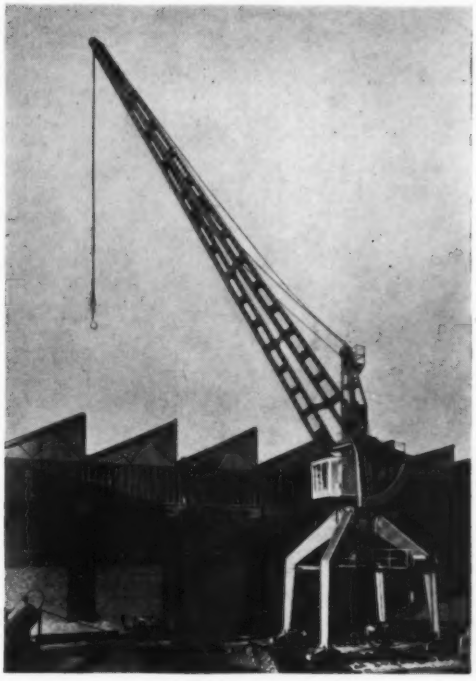


*Fig. 2. The small diameter ring permits jib counterweights to swing down on either side of ring. Level luffing jib crane by Ateliers de Construction Mécanique de Tirlemont*

If the resultant axial load lies within the circle of the ball path, it is transmitted through the upper row of balls only, and the lower row runs idle, Fig. 3*a*. When large tilting moments are applied, it is impossible for the rings to lift, since the loads are then transferred through the lower row of balls, the mounting bolts being placed in tension, Fig. 3*b*. By using a large number of rolling elements and mounting bolts, stresses are kept low, and loads are efficiently transmitted, by means of an axial couple, from the revolving structure to the fixed portal. There is a large factor of safety, and under excessive overload, the crane would overturn long before the mounting bolts failed in tension.

**Lighter and more economical designs**

In the older systems, axial loads were transmitted through roller paths, and radial loads through a centre pin. Since this centre pin was not designed to carry uplift except under temporary overload, the roller path had to be sufficiently large in diameter to contain the resultant axial load. Ball bearing slewing rings can carry uplift, and are therefore smaller in diameter than roller paths of equivalent load capacity, Figs. 4, 5 and 6. This feature not only effects economy in the slewing ring itself but also, in conjunction with other constructional improvements, enables the rest of the crane structure to be more economically designed.

The ability of the slew unit to transmit high tilting moments leads to a reduction in the main counter weights, and a corresponding lightening of the whole structure. The stability base of a crane with a live roller ring, which cannot take uplift, is the circle of the roller path. Sufficient counterweight must be carried on the revolving structure to ensure stability on this base when lifting 200 per cent of rated load. The stability base of a crane with a pintle or Roballo ring, which can transmit tilting moments, is the

*General Manager, Roballo Engineering Co., Ltd.

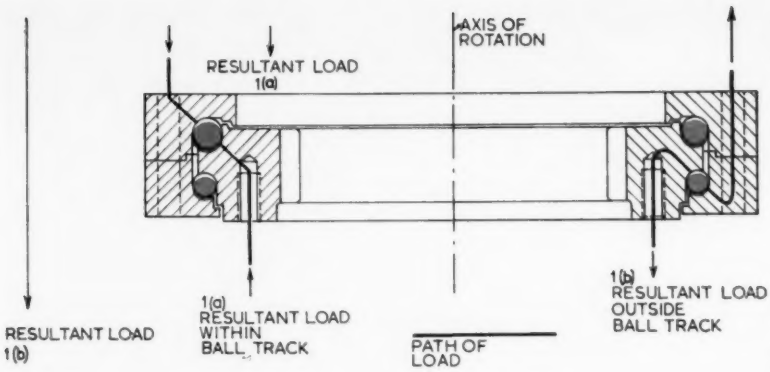
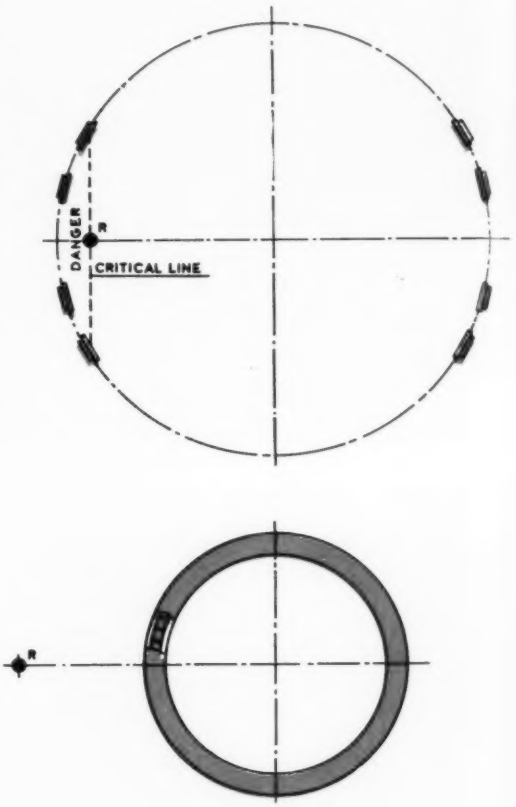

AXIS OF ROTATION
RESULTANT LOAD 1(a)
1(b) RESULTANT LOAD OUTSIDE BALL TRACK
RESULTANT LOAD 1(b)
1(a) RESULTANT LOAD WITHIN BALL TRACK
PATH OF LOAD

*Fig. 3. Showing (a) if the resultant axial load lies within the circle of the ball path, it is transmitted through the upper row of balls only. (b) When large tilting moments are applied, it is impossible for the ring to lift, since the loads are transferred through the lower row of balls*

*Fig. 4. Showing comparison in size of roller path (top) and ball bearing slewing ring (bottom) of equivalent load capacity. R—resulting moment*



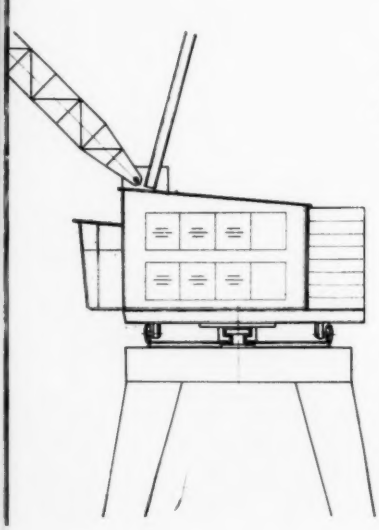

rectangle formed by the feet of the portal, which is usually a larger base than that provided by the slewing ring. This means that the lever arm of the load, and the magnitude of the moment, are reduced. The counterweight can therefore be reduced, and moreover, some of it can be placed in the portal legs. This will reduce loads on the slewing ring and the upper part of the portal, and lessen the inertia and wind resistance of the revolving structure.

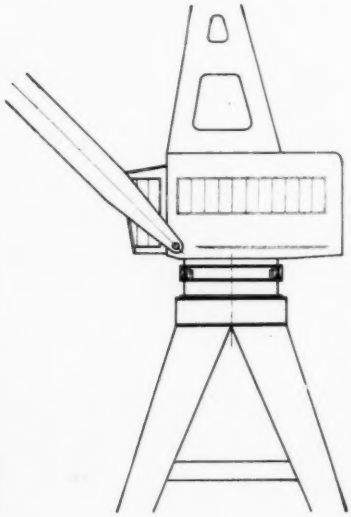
The small diameter of the ring permits the jib counterweights to swing down on either side of the ring, so they can have a greater radius of action and be made lighter, Fig. 2. The jib pivots can be positioned closer together, the weight of the cross-bracing being reduced accordingly. The tops of the portal legs can be closer, the whole portal can be lighter and the deflections at the top of the portal structure reduced, Figs. 5 and 6.

The slewing ring has a low frictional torque, and this, combined with reduced wind resistance and inertia of the revolving structure, means that slew motors of smaller power are required. In theory, travel motors and wheel loads could also be reduced, but in practice they have all tended to increase, because of the demand for increased load capacity and radius in the modern crane.

*Fig. 5 (Below left). Space occupied with a normal arrangement of jib pivot and portal legs when using a roller path*

*Fig. 6 (Below right). Showing how, compared with Fig. 3, jib pivots and tops of portal legs can be closer when ball bearing slewing ring is used*





An advantage claimed as peculiar to the Roballo slewing ring is that it is possible, by using larger balls, to increase its strength to carry such increased loads, while still retaining the same pitch circle diameters for the gear and the mounting bolts.

**Support for the bearing**

Ball bearing slewing rings are provided with an internal clearance so that they will function satisfactorily even if the portal structure is slightly distorted—for instance, by mislevels in the running tracks. It is not necessary to use heavy castings to support the bearings—a lighter welded fabrication can be used, such as a cylinder or a truncated

Fig. 7 (*Above*). *G. J. Jucho, Dortmund, grabbing cranes rated to lift* 16 *tons at* 65 *ft radius*

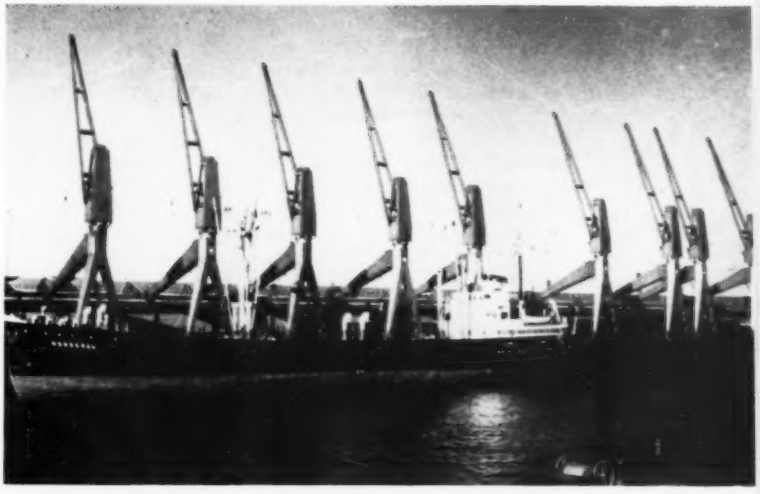


Fig. 8 (*Right*). *Kocks dockside cranes at Bremen*

Fig. 9 (*Below*). *Mounting of ball bearing slewing ring on Demag dockside crane rated to lift* 3 *tons at* 65 *ft radius*

cone, with a flange machined to give a reasonably even, rigid and continuous contact surface for the slewing ring. The portal legs are welded direct to the cylinder, and since the loads are transmitted axially through the bearings, no additional framework is required to carry radial loads. Figs. 1, 7, 8, 9, 10 and 11 show some of the mounting methods used on continental cranes.

Although some British Standards tend to discourage the use of mounting bolts and screws in tension, this practice is nowhere forbidden. The modern bolt is in fact, a highly reliable fastener, which is designed to be placed in tension. The threads are so strong that the bolt, when used with a standard nut, will fail in tension before the threads strip. For rated loads and overloads of the crane, the maximum tension in any one bolt is easily calculated, and its value can be reduced to any desired level by using more bolts, or bolts of larger diameter. Alternatively, the factor of safety can be increased by using bolts of higher tensile material.

There is a growing tendency for high tensile grip bolts to supersede rivets as fasteners for the portal framework. Individually bolts are more costly than rivets, but collectively they are more economic and require less time and skill to fit. If high strength bolts are used, it is possible to mount the slewing ring bolts by exactly the same pre-tensioning methods used for the rest of the structure. A ball-bearing slewing ring is relatively easy to lift and fix in position, because it is supplied as a complete unit, ready for installation; no adjustments are required, and the cost of fitting and centring a separate gear ring is eliminated. If it should ever become necessary, the whole slew unit can be removed and replaced by jacking up a few inches only, Fig. 12. This occasion is most unlikely to arise as the crushing strength of a single ball far exceeds any load which could conceivably be placed on it in the bearing.

**Comparison with pintle**

A pintle construction offers many of the advantages outlined above, but presents the designer with several problems. A pintle transmits tilting moments from the revolving structure by means of two bearings, which exert a radial couple. One bearing carries radial loads only: the other bearing carries an opposing radial load and all the thrust loads, Fig. 13. The magnitude of the radial loads can be reduced by spacing them further apart, but the pintle must then be made stiffer, or bearing life may be prejudiced. A compromise is usually found with pintles 10-20 ft in length, weighing several tons. An equivalent height of portal is required to accommodate them. In some cases, this additional height is useful; in others, it is an unnecessary expense. For proper functioning, the two bearings must be accurately centred, and their tracks should lie in parallel planes. Unlike the ball-bearing slewing ring, which required only axial support, each bearing must be surrounded by a framework suitable to transmit radial loads to the portal legs.

Harbour authorities are the main purchasers of dockside cranes. It is they who draft specifications, examine tenders, and finally use the cranes. What advantages do the new bearings offer them? Summarized, they amount to low friction, long life, easy maintenance, and the absence of all adjustments. Ball-bearing slewing rings are made in Gt. Britain in sizes up to 13 ft dia or more, and designed to carry tilting moments of 3,500 ft tons or more. They are already in use in a number of British-built dockside cranes.

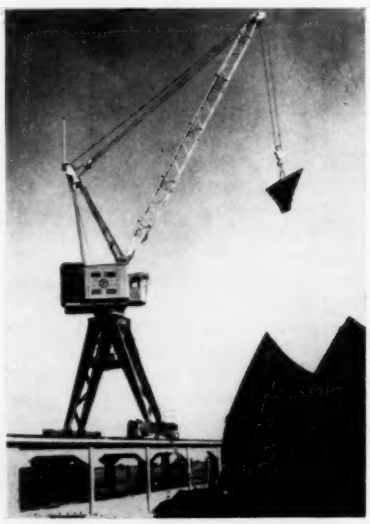
10

*Fig.* 10 (*Above*). *Titan-Anversois harbour cranes rated to lift 5 tons at 118 ft radius*

*Fig.* 11 (*Below, left*) *A Peiner shipyard crane*

*Fig.* 12 (*Below, centre*). *The whole slew unit can be removed and replaced by jacking up a few inches*

*Fig.* 13 (*Below, right*). *Showing the construction of a pintle where one bearing carries radial loads only, the other bearing opposing radial load and all the thrust loads*



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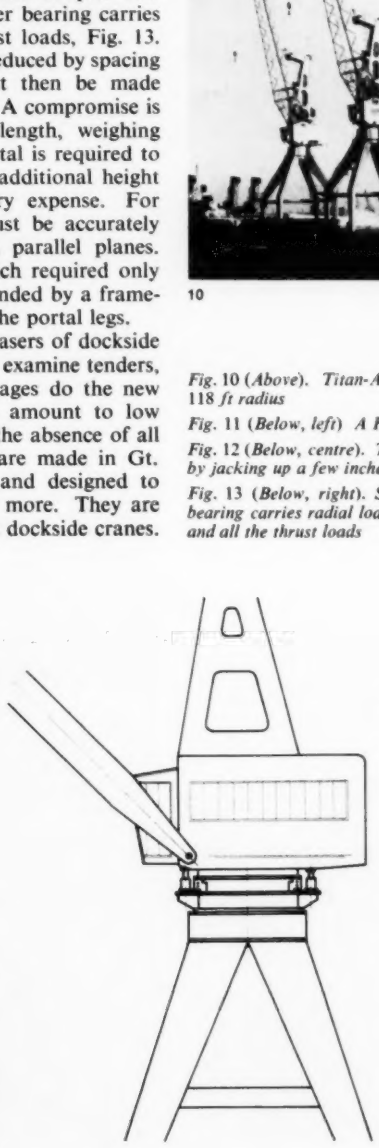

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13

# Overhead Conveyors in Fish Processing Factory

1

*Fig. 1. A section of the catering packs line showing operatives weighing off the fish into aluminium trays. The overhead conveyor for freezing trays is shown here delivering trays to the loading station*

*Fig. 2. Showing the inlet points on the washing machine. Freezing trays are passed through on the overhead conveyor on the left of this unit, while the conveyor on the right is handling the aluminium fish kits*

*Fig. 3. The fish kit loading and unloading station for the overhead conveyor. This conveys fish kits through the washing machine and subsequently returns them to this particular point on the factory floor*

AT THE recently opened Grimsby factory of Eskimo Foods, Ltd., a washing machine for used fish trunks and fish trays has been installed in the roof of the factory, in order to utilize floor space to the best advantage.

The washing machine has a tank measuring about 16 × 6 × 3 ft and holds 1,500 gallons of water which is heated to a temperature of 200 deg F. The machine is divided into two compartments, trays in which filleted fish has been packed being washed for approximately 30 seconds each in one compartment, and trunks in which the fish arrives from the docks washed for approximately two minutes each in the second compartment. Re-circulated water is used, but it is automatically and finely filtered before re-use.

Two dual-directional overhead chain conveyors made by Teleflex Products, Ltd., have been installed at the factory for the purpose of picking up used fish trunks and trays from the factory floor, passing them through the washing machine and returning them to the points on the factory floor where they are needed.

The trunk conveyor picks up used trunks and puts down clean ones at the end of the hand-filleting lines. Trunks are handled on to and off of this 180-ft long conveyor as required by the operator weighing out 5-stone trunks; the conveyor speed is about 10 ft/min.

The tray conveyor, 500 ft in length, with carriers taking two trays each at 6 ft 8 in intervals, picks up used trays from the two 'knock-out' positions and puts them down along the whole length of the catering pack weighing and packing section and at the tray-filling station on the consumer pack weighing and packing section. The speed of this conveyor is about 40 ft/min.

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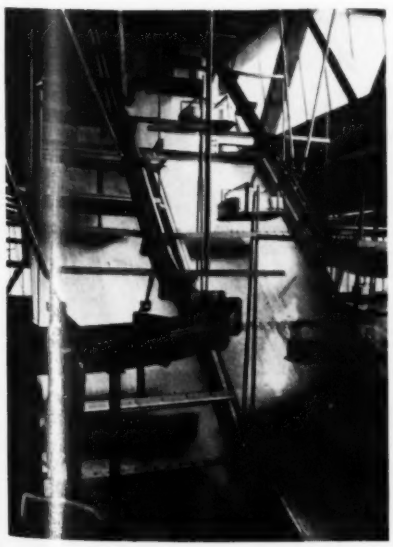


3

# LINDEN CRANE CLIMB

## Lower Cost Method for Multi-storey Building

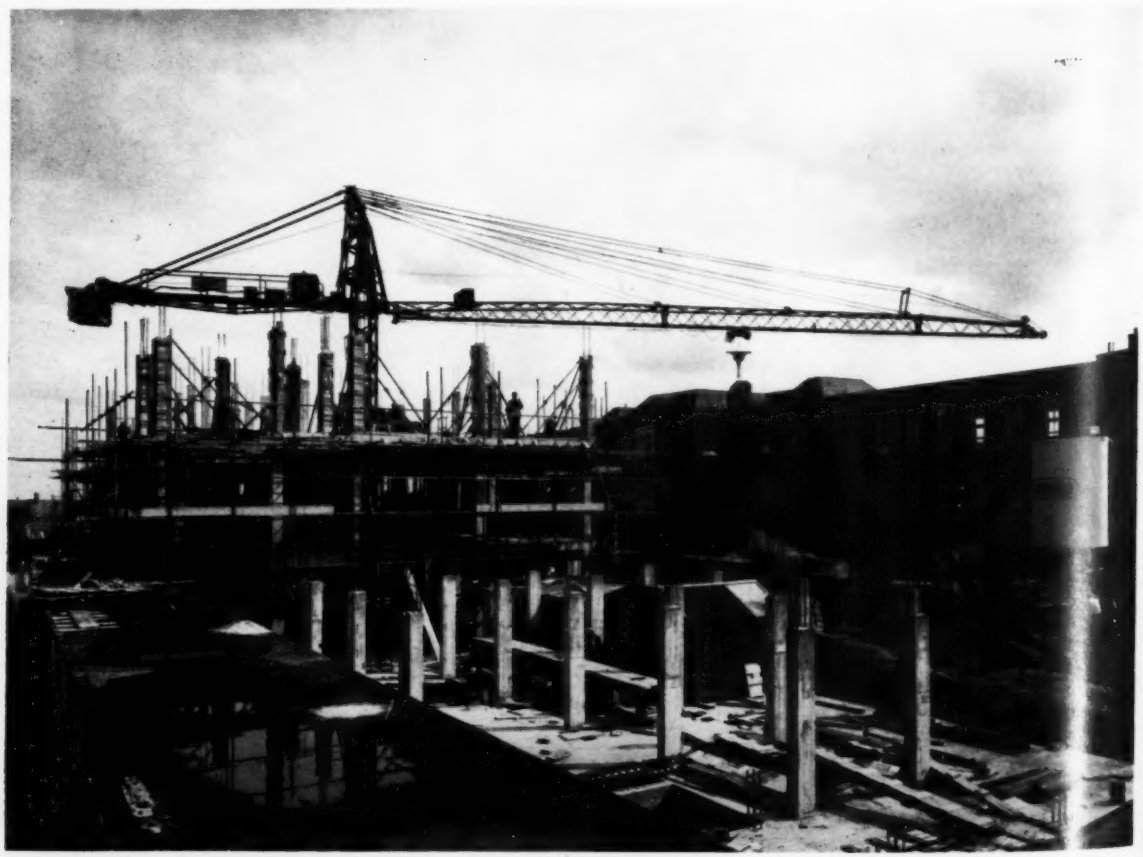
by D. M. Potter, B.A. (Oxon)

As the erection of buildings of greater height occupying most of their site area becomes increasingly common, more attention is being given to the mechanical handling devices needed to overcome the special constructional problems involved. The mobile tower crane (according to J. F. Eden in his paper to the Institution of Structural Engineers on February 27th, 1958) introduced into this country by the D.S.I.R. as recently as 1950, has found general use up to heights of 100 ft—greater with restrictions, while in France systems of tying them to buildings has permitted cranes 250 ft or more tall. French and German cranes although rail mounted have for some years been adapted for climbing, and their manufacturers in recent years have designed climbing models. Linden is claimed by the makers to be the first climbing crane from which others followed.

In effect the climbing crane has the appearance of a short-mast tower crane and the same applications as a tower crane of unlimited height, since as the building rises so does the crane climb up it. The climbing crane jib is consequently always at working height above the top of the structure without the expense, possibly twice as great or more, of a tall tower crane. Because of the novelty of the climbing crane it was decided to carry out an observation of one in use.

The crane concerned was a Linden, a type which has been manufactured in Sweden for some seven years and is now distributed in Great Britain by Climbing Cranes, Ltd., of London, who are arranging to manufacture it under licence.

*Crane prior to climbing*



*Winch in position*

The particular crane inspected was a Linden Type D.25 with the following specification:—

| | |
|---|---|
| Jib length: | 86 ft 5 in |
| Radius: | 0-82 ft |
| Rated capacity: | 1 ton |
| Jib type: | Horizontal |
| Maximum load: | 2½ tons |
| Maximum load radius: | 27 ft 6 in |
| Height of lift (standard): | 260 ft |
| Height under jib: | 42-55 ft |
| Tail radius: | 31 ft 6 in |
| Weight (gross): | 11·4 tons |
| Hoisting speed: | |
| (2 part rope): | 190 ft/min |
| (4 part rope): | 95 ft/min |
| Traversing speed: | 114 ft/min |
| Slewing speed: | 1·1 r.p.m. |
| Control: | Remote rotary switches |
| Hoist motor: | 15 h.p. |
| Mast cross section: | 2 ft 7½ in × 2 ft 7½ in |
| Climbing gear: | Rope and power winch |

The contractors on the site to whom the crane belonged were The Kleine Co., Ltd., responsible for the reinforced concrete work, which in this case involved poured concrete foundations, pillars and floors to a height of five floors above the half-height basement.

It is clear that this Linden Climbing Crane has a relatively short mast for the horizontal-slewing jib radius of 82 ft.

**General Work of the Crane on Site**

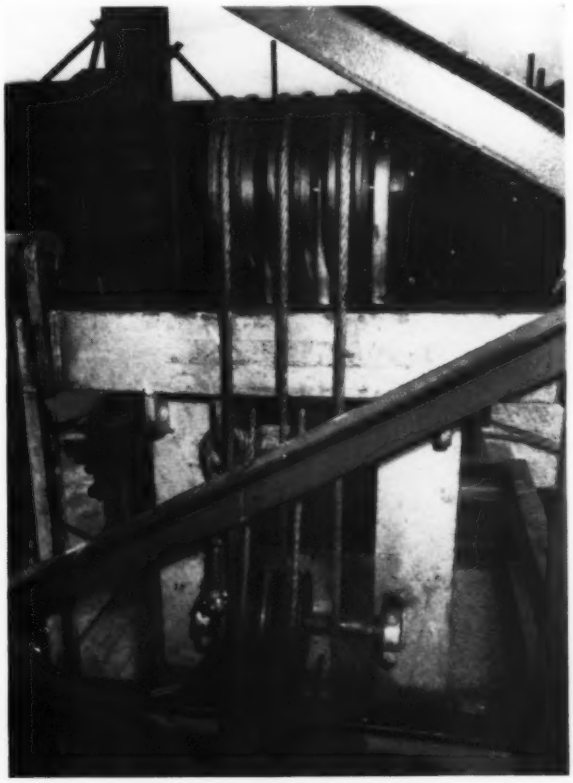
This was the first Linden Climbing Crane purchased by the Kleine Company and when inspected they had had it in continuous use on this site for 16 weeks without any trouble, according to the site foreman. It had been erected on the sub-basement floor with the four inclined supporting legs positioned as in the instructions and in due course protruding through the first floor because the basement was of half height in this case. The principal duty required of the crane was lifting often at the maximum radius of 82 ft a fully loaded skip of concrete to wherever work was in progress, the skip weighing roughly 5 cwts and the load 10 cwts. On occasions loads of reinforcing bars up to 1½ tons in weight had been moved, while shuttering, light sections, barrows and miscellaneous equipment were frequently handled by the crane. On a typical day 60 cu. yd. of concrete were lifted, lowered, and placed by this means. Of special advantage in the eyes of the Kleine operators were the remote control, enabling the crane driver with the control box slung on his shoulders to walk to where the load was being deposited, and the automatic safety devices giving light and sound warnings and halting the lift when overload occurs. During commissioning the crane was tested with a 37½-cwt overload without the jib being observed by the Kleine staff to deflect substantially. They also commented on the entire crane being packed on one 10-ton vehicle, the principal components being the five sections of mast, the three sections of jib, the two sections of counter-jib, the motors and centre-head wheel.

A particular reason for the selection of the Linden crane for this construction occurring very close to occupied hospital wards was that of silence. It is especially quiet in operation—both lifting and slewing.

The Kleine site foreman was of the opinion that it would have been necessary to have increased his team of 40 men on the job by at least a further 10 labourers had they not had this crane and now they were capable of delivering the concrete at three times the speed at least.

When the building was first inspected, the following

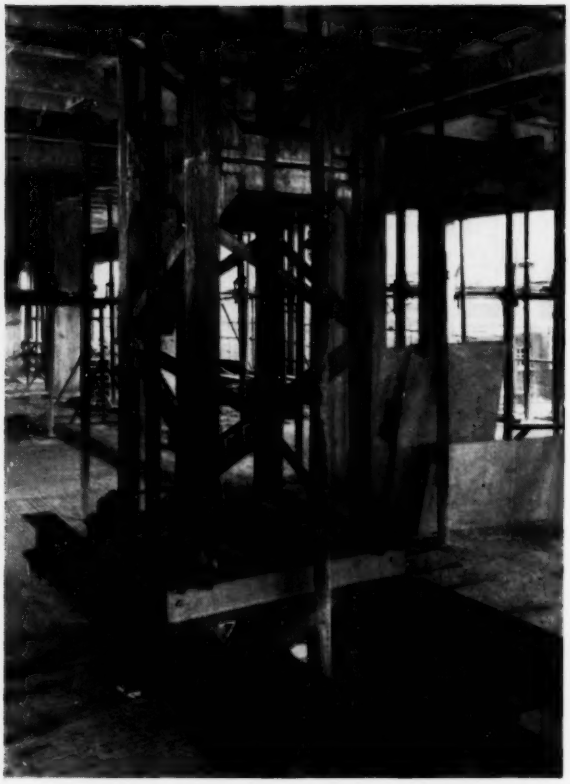
*Rope coming over sheave on right from winch*



approximate levels were completed in the sense that the reinforced concrete floors, beams and columns were finished:—

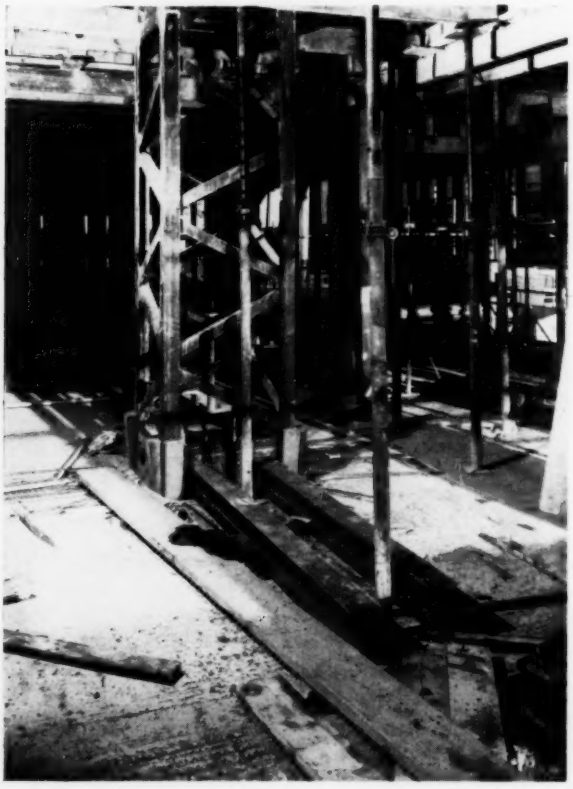
| | |
|---|---|
| Basement | 5 ft |
| Ground floor | 11 ft |
| 1st floor | 11 ft |
| 2nd floor | 11 ft + columns |
| Top height of work | 38 ft |
| Clearance between top of work and jib | 17 ft |
| Jib to crane base | 55 ft |

It will be noticed that only 17 ft of head room now remained between the top of the unfinished columns and the



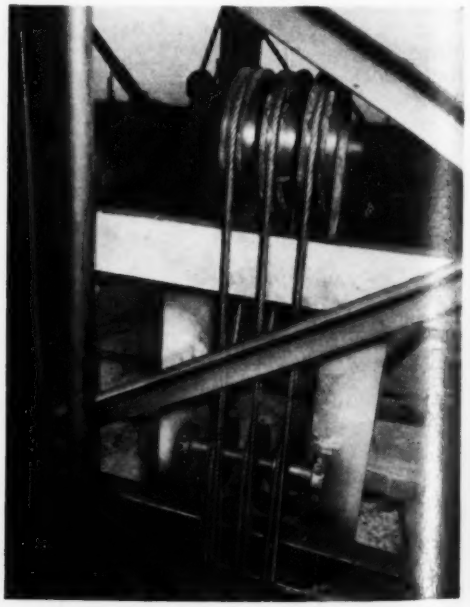
*Safety device resting on R.S.J.s. Two R.S.J.s lying in between ready to be pushed through the bottom of the base mast section*

*R.S.J.s in position supporting the crane in new position*



*Sheave bracket fitted in between base mast section and next one above*

*Sheaves on opposite side of winch unit taking return of rope*



second floor and the underside of the jib. This obviously caused operating difficulties since the concrete lifting hopper and hook linkage required perhaps 12-14 ft or more, leaving only a foot or two of real clearance over obstructions. It was at this stage that it was decided to 'climb' this particular crane, the intention being to position the base of the crane on the first floor, i.e. 16 ft up, and wedge it on the floor above 27 ft up; the height under the jib to the basement floor thus being 71 ft, giving a possibility of finishing the third and fourth floors and roof with one further 'climb'.

On the observed climb a number of delays occurred due to causes which might be said to be external to the actual climb itself, viz., obtaining the necessary supporting R.S.J.s from elsewhere; an unusual disconnection and reconnection of the main power cable necessitated by the special conditions on this site; the unusual requirement by the site consulting engineers present that Acrow props should be placed under adjoining beams probably in view of there being recently poured concrete structures adjoining. It was apparent that normally the total time for climbing a crane is from $2\frac{3}{4}$ to 4 hours including setting up the winch and removing equipment after the climb. This depends on site conditions. The crane can be in use all the time except during the actual climb.

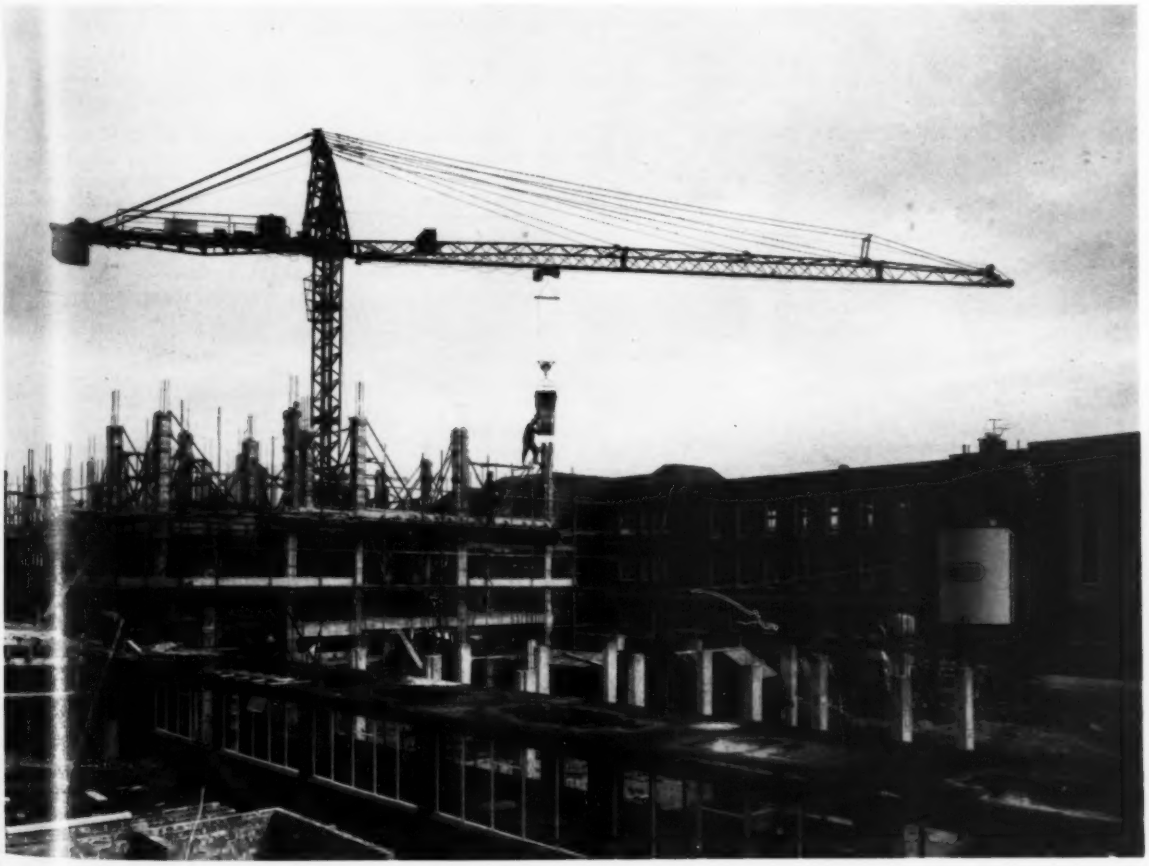
The actual observed lifting of the crane itself took less than half an hour and movement at the crane base during the lift was seen to be not more than $\frac{1}{4}$ in from side-to-side, the process being remarkably smooth and stable.

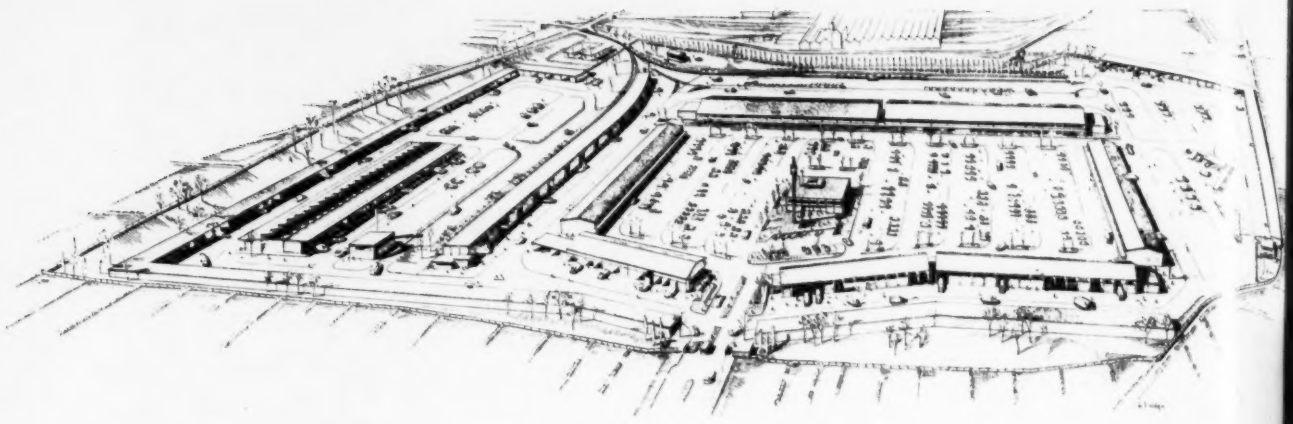
The procedure of 'climbing' the crane was secured by attaching to the crane mast at second-floor level a portable frame containing roller guides in which the mast may slide; incorporated in this frame is a motorized winch on one side and pulleys opposite. In this case, bottom pulleys were attached inside the mast at ground-floor level (not at the base as would be customary) and a steel cable was wound a number of turns from the winch, under the bottom pulleys, up to the pulleys in the winch frame, down to the bottom pulleys again and back to the winch. In this way the crane was held in a 'U'-shaped loop of cables which when required wound on to the winch at the top and so hoisted the crane. When the crane base reached first-floor level two R.S.J.s were pushed through slots in the base, so carrying the $11\frac{1}{2}$ tons of crane dead-weight. Care was taken to ensure these R.S.J.s reached beams on either side. A safety collar was erected on the floor below the winch; this consisted of dogs pivoted in a rigid frame in such a way that when the crane was lifting they were free, but had the crane fallen they would have gripped the mast.

The observed lift of the crane was a complete success. It was unrehearsed and without warning, so the fact that there were teething troubles not connected with the lift was not a discredit to the crane.

However, after the surprisingly short time actually climbing, the work of handling material from a much greater height was ready to be continued immediately, showing that the Linden Climbing Crane is in fact capable of dealing with almost any practical building height. In addition it can operate effectively from any part of a building, freeing lift shaft bottoms before the end of the construction and avoiding much heavy auxiliary equipment.

*Final position of crane after 'climbing'*





*Artist's impression of the Sheffield market by the architects, William Holford and Partners*

# MECHANICAL HANDLING AND REFRIGERATION EXHIBITION AT SHEFFIELD

An exhibition of mechanical handling equipment was recently held at the new site for the new Sheffield market. Sheffield City Council and the Horticultural Market Council collaborated in organizing the Exhibition.

Amongst the exhibits displayed were the following examples of mechanical handling equipment.

2

**Fig. 1.** (*Below*) Yale & Towne's equipment on show comprised: Series 51 rider electric fork truck, Warehouser rider electric straddle truck, Warehouser rider electric low lift platform truck, Worksaver pedestrian-controlled fork truck, Worksaver pedestrian-controlled low lift pallet truck, Worksaver tractor, Panther, Zephyr, Blue Streak and hydraulic elevating hand lift trucks, one trailer. Yale & Towne Manufacturing Co.

**Fig. 2.** (*Above*) The Hyster exhibits included a comprehensive range of trucks and the illustration shows one of the larger models lifting a smaller on to a lorry deck. Leverton (Industrial), Ltd.

Fig. 3. (*Below*) The Brush SD model bat ry-electric industrial tractor, capable of wing 1 to 3 tons. Brush Electrical Eng Co., Ltd.

5

6

Fig. 4. (*Below*) Yale Series 51 battery electric fork lift truck unloading potatoes from a supplier's lorry at the new market. Yale & Towne Manufacturing Co.

**Fig. 5.** The Weeks mechanical handling system consisting of a hydraulic-lift trailer and a large pallet, in this case with a platform 10×5 ft. The lift action of the trailer is operated from the tractor, in this case a Massey-Ferguson. The capacity of the trailer and pallet is 5 tons. This illustration shows the trailer ready to be backed under the pallet. Samuel Wilson & Son, Ltd., Sheffield.

**Fig. 6.** Here the Weeks trailer is lifting the pallet while the Lord Mayor of Sheffield looks on. Samuel Wilson & Son, Ltd., Sheffield.

**Fig. 7.** (*Below*) The C.L.12 portable wood-slat conveyor/elevator with a hydraulic lift for effecting the incline and a motorized drive. Fourways (Engineers), Ltd.

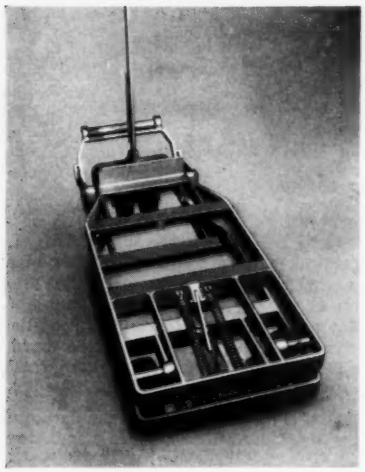


**Fig. 8.** (*Above*) A Stacatruc carrying a loaded pallet on the forks while hauling a trailer containing a pallet about to be taken off by a Clark 'Powrworker' (pedestrian-controlled) fork truck. I.T.D., Ltd.

**Fig. 9.** (*Left*) The Samson 'Junior' platform truck, a Danish product imported by Fenter Machine Tools, Ltd., of Birmingham, is noted for the extremely easy lift and lowering arrangement. The ingenious stop and release finger seen in the illustration rides in a horizontal cam; the steering handle provides the leverage. Samuel Wilson & Son, Ltd., Sheffield.

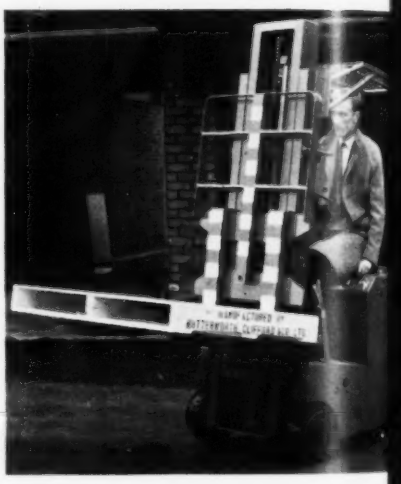


**Fig. 10.** (*Right*) The Montgomerie Reid 'Ministack' electric fork lift truck. Montgomerie Reid Eng. Co., Ltd.

**Fig. 12.** The Roadrailer van trailer capable of operating on roads or railways when attached to a suitable traction unit. British Railways.

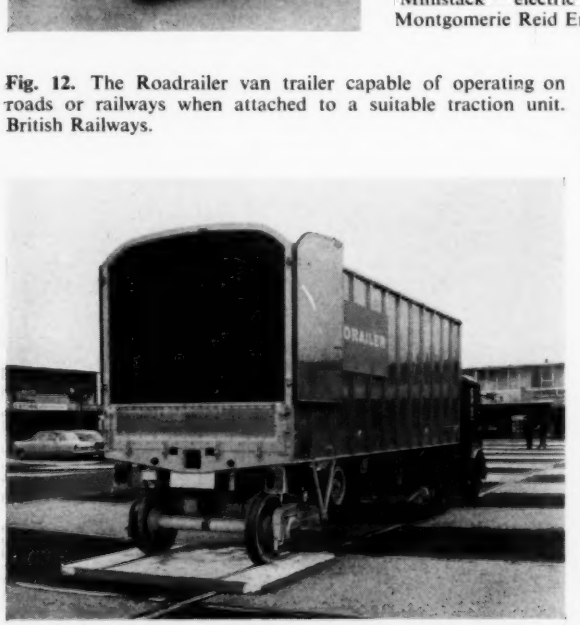


**Fig. 11.** One of the new Universal IGEF electric fork lift trucks in action. Also on the stand was the new IGEU for use in confined spaces, having a 57-in turning radius. Coventry Climax Engines, Ltd.

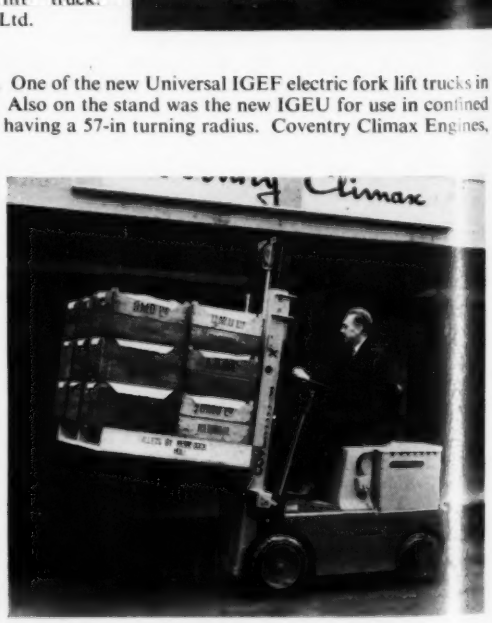


Fig. 13. A 'Harbilt' pedestrian-controlled fork lift truck loading a lorry while in the rear is a 'Harbilt' pedestrian-controlled electric truck which has a payload up to 25 cwt and a range of 8-14 miles without recharging. Thos. Hill (Rotherham), Ltd.

**Fig. 14.** (*Above*) A Lansing Bagnall TD200 industrial diesel-engined tractor towing a trailer in the course of loading with a Lansing Bagnall FOER 3 electric fork truck of 2,800 lb capacity. Lansing Bagnall, Ltd.

**Fig. 15.** The 'Teddy' (Omic, Ltd.) electric tractor with a turning circle of 68 in outer radius and a trailer load capacity of 4 tons. Alongside are 'Sherpa' lifting trucks made by Salisbury Precision Engineering, Ltd. The Chain Annealing Co., Ltd., Sheffield.

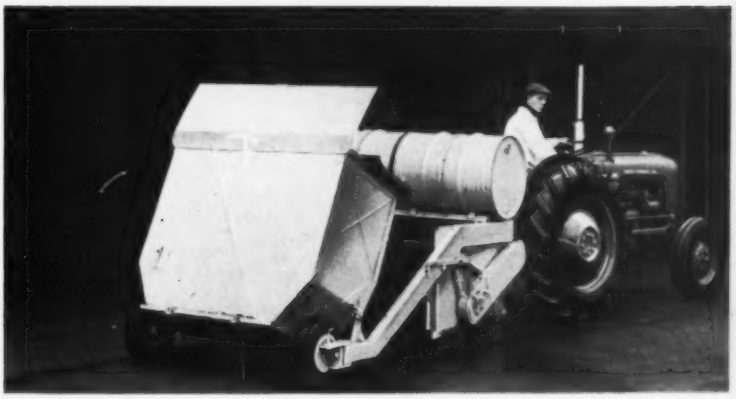


**Fig. 16.** (*Above*) The new Sturdiluxe 'Glutton' road sweeper-collector made by H. Young (Motors), Ltd., of Chester-le-Street. It has capacity for 1 cu. yd. of refuse and carries two 40-gal water tanks. It is tipped, as seen in the photograph, by a hydraulic system operated by the driver. Samuel Wilson & Son, Ltd., Sheffield.

**Fig. 17.** (*Below*) On this stand were displayed various items of mechanical handling plant for sale or hire, including Coventry Climax fork trucks and a variety of wooden and steel pallets, conveyors, etc. The T. W. Ward subsidiary, The Ensign Conveyor Co., Ltd., had on view mobile flat belt conveyors. Thos. W. Ward, Ltd.

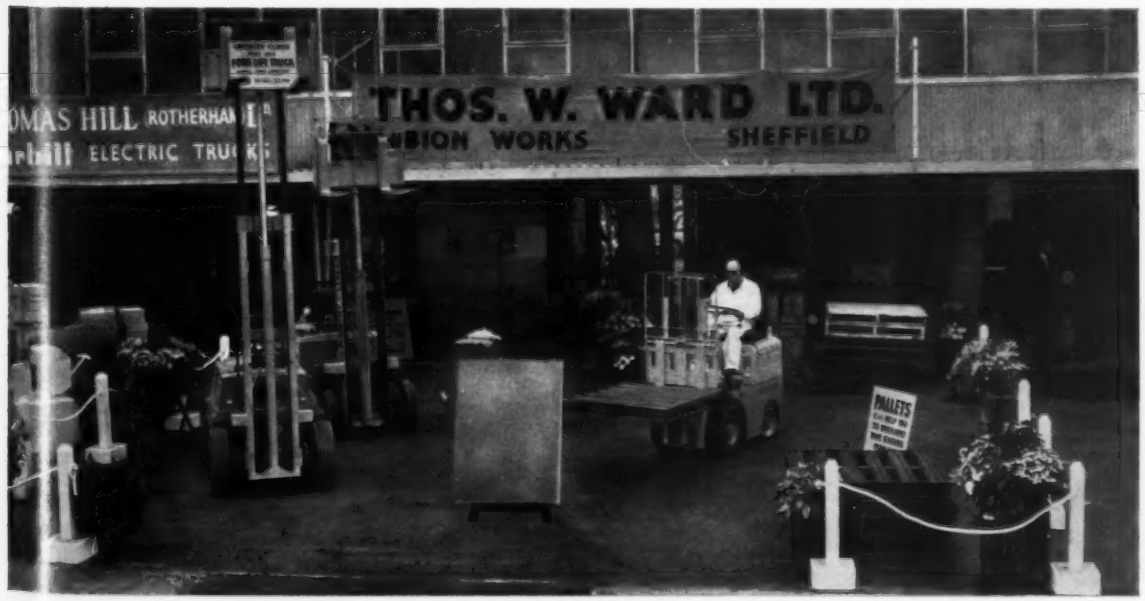


**Fig. 18.** (*Left*) The photograph shows a Conveyancer 3-ton electric tractor pulling two bogies designed for lifting or towing on to which a D424 diesel 4,000-lb capacity fork truck is placing a load. Conveyancer Fork Trucks, Ltd.

**Fig. 19.** (*Below*) The new Clark N.R.40 2-ton reach truck capable of operating in gangways as narrow as 6 ft 6 in. The steering is power-assisted; two wheels are driven. I.T.D., Ltd.

**Fig. 21.** (*Below*) The exhibits illustrated on the stand of the Potato Marketing Board include crates designed to hold 6 cwt of the cardboard cartons each containing 56 or 28 lb of new potatoes. Small 56-lb sacks were shown to indicate how easier handling could be achieved. Among various Jordan stapling and banding box fastener devices was a very ingenious wire twister for closing sacks. Frederick Jordan & Co.

**Fig. 20.** (*Below*) One of the new horizontal wood slat conveyors made by R. A. Lister & Co. They are motorized in independent lengths which may be coupled together by a junction unit incorporating a roller. Lister trucks were also on view as well as an inclined portable conveyor. T. C. Harrison, Ltd., Sheffield.

**Fig. 22.** (*Below, right*) The new 15/20 Conveyancer electric fork lift truck battery driven by D.P. Kathanode batteries and particularly designed for confined space operation. Conveyancer Fork Trucks, Ltd.

# THE RELIANCE "CUB" IN ACTION

## New Small, Powerful Industrial Tractor

A old-established company, Reliance Trucks, Ltd., has after a prolonged development period just started full production of a new industrial tractor. It is the 'Reliance Cub' which, as the name implies, is a very small vehicle providing the very effective tractive power of 2,200 lb drawbar pull which in terms of a load on wheels may be hauling up to 20 tons. The accompanying specification abbreviates the essential details.

**Operating Test**

By permission of the makers one of the three prototype machines was recently tested at their works by our representative. It was started from cold and driven inside and outside the factory premises both without loads and also hauling one and two trailer trains carrying weights of 2 tons 2 cwt on each tractor. Machines with and without cabs were tried and found to have roughly the same characteristics.

Even to a driver handling this tractor for the first time it gave a strong impression of ease of control, certainty of handling and exceptional manœuvrability in confined spaces. The driver's view was good all round and he could just see the tow-jaw at the rear, in the model without the cab, particularly valuable when reversing up to trucks preparatory to pulling them away. It was possible to drive the truck to within ½ in of obstructions and because of the short wheelbase there was little risk of striking objects when cornering. In this connection it should be appreciated that the small turning circle not only permitted the 'Cub' to turn round in a normal width factory gangway, but it also made it much easier to take round right-angle and 'U' bends which abound on most factory, railway platform and dock layouts.

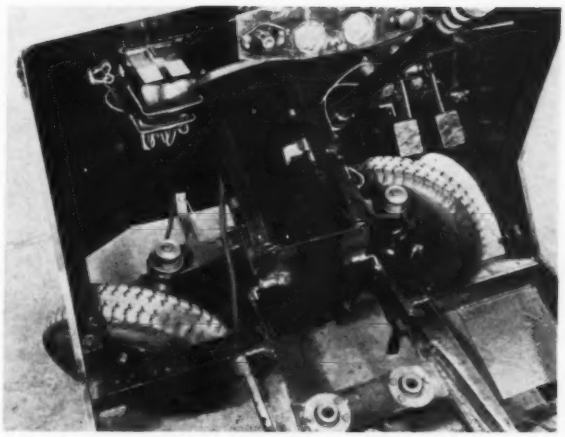


*Fig. 2. Front suspension and steering assembly showing the acute angle of wheel lock. This photograph also illustrates the very robust construction of the integral chassis and body*

When the train of trailers was hauled over a comparatively rough unmade road, it was found that the riding comfort for the driver was exceptionally good. No less important under these conditions was the stability of the 'Cub', which even when under load at an acute 'U' bend showed no signs of lifting or wheel spin in spite of the induced jerks from stops and starts on an incline of 1 : 20 at a junction with a public roadway carrying traffic.

Starting was excellent and the engine difficult to stall; the first feature rendering it unnecessary to keep the engine running when the tractor is standing and the second giving the driver the opportunity of using the clutch properly. The foot-brake, especially when applied with firm pressure, was extremely effective. The hand-brake lever is of the dash-pull type, and on a production model tested holds the tractor and loaded trailer train on an incline, which apart from other considerations is important to the driver in allowing him to engage gear from a stationary position on a slope.

It was easy to see that much of the damage expected in industrial applications will be avoided in the case of the 'Cub' by the assistance given the driver. An inspection of the disassembled tractor indicated that its robust design would also reduce the risk of damage; for instance, the body cladding is of ½ in thick steel plate, solid enough to permit shunting if necessary.

The model tested had reserves of power and speed well beyond the demands made in the test.

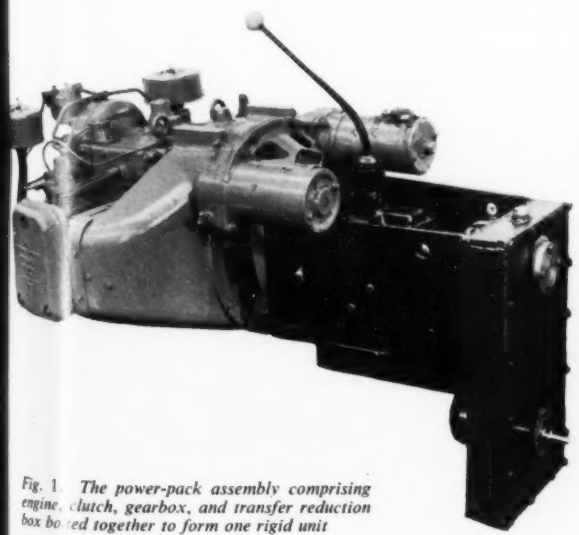


*Fig. 1. The power-pack assembly comprising engine, clutch, gearbox, and transfer reduction box bolted together to form one rigid unit*

**Maintenance**

It was then decided to see how maintenance would be carried out.

To avoid the usual servicing pitfalls the 'Cub' has been constructed with only three points for grease-gun lubrication, other bushes or mountings normally requiring such maintenance being of nylon or rubber. To improve accessibility in major overhauls the whole machine is designed for quick dismantling into four units, viz.: the power pack, the front suspension and steering, the rear axle and suspension, and the integral chassis and body. Maintenance appeared greatly simplified in many directions.

**Applications**

It is expected that the applications will normally be in factories, airports, railways, docks, warehouses and in fact any traction demand within its capacity. The prototypes which have been in course of development for no less than 2½ years have been tried in most of these applications. Since full production began in July 1960 the first quarter's output was sold in a few weeks mainly to customers with these interests.

Our representative also visited a factory with the Reliance tractors in use to observe an actual application. By permission of T. F. Firth & Sons, Ltd., of Brighouse (Yorks.), carpet manufacturers, a tour was made of their three factories which cluster round a main cross-road which has to be traversed by their fleet of three old Reliance tractors and one new Reliance 'Cub', with a second on order. These tractors are used in conjunction with 23 Reliance trailers and it is easy to see the virtue of such a combination in this factory where the tractor/trailer system is applied to great

*Fig. 3. The outside turning circle is 11 ft dia*

*Fig. 4. The Reliance 'Cub' tractor in operation at T. F. Firth & Sons, Ltd., Brighouse, the well known carpet manufacturers*

advantage. A trailer carrying raw material is delivered to a department, from which is hauled away another trailer full of completed work. Consequently, the tractors haul full trailers from department to department, but leave them in the department while the operation on the work is completed. The trailers are so constructed that they are easily man-handled within the departments.

The hazards encountered in this service are inclines, cobbled yards, narrow doorways, and the main road crossing, including travelling for ¼ mile or more on a fast traffic highway. On the trailers are somewhat heavy loads (such as 1,400 lb) of beams ('reels' of warp), yarn, finished carpets, and maintenance equipment. The carpet production within each shop is, of course, of the very highest standard since the Firth company enjoys a world-wide trade and a demand taxing capacity to the full. This in its turn makes bigger demands on the inter-departmental transport which is carried out by these Reliance tractors and trailers as a non-stop service.

**Reliance Cub Abbreviated Specification**

*Engine:* Coventry 'Victor Vixen' horizontally opposed, twin-cylinder, air cooled diesel, developing 20 b.h.p. (automotive rating) at 2,000 r.p.m. governed maximum speed. Capacity, 1,292 c.c.

*Transmission:* 9-in dia hydraulically operated single dry plate clutch. Three speed and reverse gearbox with synchromesh on top and second gears.

*Wheels and tyres:* Pressed steel wheels fitted with pneumatic tyres, 18 × 4½ in × 6 ply (457 × 114 mm) at front; 18 × 7 in × 6 ply (457 × 178 mm) at rear.

*Brakes:* Four wheel hydraulic. Independently operated hand brake on rear wheels.

*Electrical system:* 12-V heavy-duty battery, starter, dynamo, ammeter, horn and all switches.

*Towing bracket:* Heavy-duty solid tow jaw with ⅛-in dia pin and safety clip.

*Seating:* Bucket-type driver's seat.

*Drawbar pulls:* 1st gear, 2,200 lb; 2nd gear, 1,400 lb; 3rd gear, 750 lb.

*Speeds:* 1st gear, 3·9 m.p.h.; 2nd gear, 6·8 m.p.h.; 3rd gear, 12 m.p.h.

*Outside turning circle (dia):* 11 ft.

*Principal dimensions:* Length, overall—72 in (1,829 mm) plus 6 in (152 mm) (for rear towing bracket); Width, overall—40 in (1,016 mm); Height, overall—52 in (1,321 mm), 76 in (1,930 mm) with cab; Ground clearance—3½ in (89 mm); Weight without cab—23¼ cwt.

*Main optional extras:* Open-sided glass fibre cab, with windscreen wiper. Passenger seat. Side and rear lights. Headlight. Speedometer. Multi-position tow jaw. Spring-loaded tow jaw (in lieu of solid type); Front towing bracket.

*Fig. 5. Another view of the 'Cub' tractor in operation at T. F. Firth & Sons, Ltd.*

# AN EXPERIMENT IN EDUCATION

by D. J. Lister, M.A.(CANTAB)*

BRITISH TIMKEN DIVISION of The Timken Roller Bearing Co. has a large thriving apprenticeship scheme. The company is proud of its educational facilities and is continuously reviewing its existing methods and seeking new means of improving them. It recently instituted a further experiment in education at the Duston factory which aims to improve the self-confidence, clear thinking, and sense of responsibility of senior apprentices. The experiment was organized as set out in the following.

A senior apprentices' class was formed, consisting of graduate, commercial and student apprentices, together with all technician and craft apprentices in the last 18 months of their training. The numbers in the class varied between 30 and 40, because of sandwich course attendances, etc. There was one lady student apprentice in the class.

Twenty-one executives were persuaded to deliver lectures on their responsibilities and the work of their departments. The lectures took place at a rate of one per week, and the subjects included safety, production methods, development, technical sales, and service engineering.

**The Projects**

The projects for the apprentices were briefly: (1) chairman to the lecturer; (2) chairman in the committee session; (3) secretary in the committee session; (4) re-deliver lecture to junior apprentices, and prepare printed précis; (5) lecture to senior apprentices.

One of the senior apprentices was selected each week to act as chairman to the executive during his lecture. This involved contacting the executive a few days before the lecture to obtain a short career history from him, introducing the lecturer, controlling the question and answer session after the lecture, and making an appropriate speech of thanks at the end.

Following each lecture, the class of senior apprentices was split into two committees. A chairman and secretary were then selected for each committee. The job of each committee was to prepare a précis of one half of the lecture, one committee dealing with the first half, the other with the second. The duty of the chairman was to guide them in their consideration and discussion of the points made by the lecturer. The secretary was to make notes and prompt his chairman when necessary.

After the committee session, another senior apprentice was then selected to re-deliver the executive's lecture to the junior apprentices at a later date. He would have the précis produced by the two committees, the lecturer's notes and visual aids, and his own notes made during the lecture, to help him in doing this. He was also allowed to approach the executive concerned, to check any dubious points and to ensure that his information was accurate.

Having re-delivered the executive's lecture to the junior apprentices, the senior apprentice would then be responsible for producing 200 copies of a complete précis of the executive's lecture. This would involve (*a*) writing the précis, (*b*) checking the précis with the education officer for grammar, spelling, etc., (*c*) checking the précis with the executive for technical accuracy, (*d*) liaison with the typists' pool for cutting the stencil, checking proofs, and verifying the final copies.

**Lecturing to the Senior Apprentices**

The most senior of the apprentices (such as graduates) were also required to deliver a short lecture of their own choice to the senior apprentices. This lecture was given during the half-hour before the beginning of the main lecture each week. No restrictions were placed on the subject chosen, although the senior apprentice selected was required to inform the education officer of his choice of topic before preparing his lecture. Subjects selected included cost accounting, unit trusts, car racing at Silverstone, Canadian sports, modern architecture, brine mining, surface measurement, industrial psychology, the equality of women, and Trades Union history.

It is worth noting that the senior apprentices' class formed a very difficult lecture audience on account of its composition, since craft, technician, student, commercial and graduate engineering apprentices all have widely differing backgrounds and interests. Even an experienced lecturer might have found it difficult to keep all sections of the audience interested.

The chairman to the lecturer and the senior apprentice lecturing to the senior class were nominated a week in advance. The committee chairman and secretaries were nominated at the end of each main lecture, and the apprentices to re-deliver the main lecture to the junior apprentices were only selected after the committee session.

This was an essential part of the organization of this experiment. Lack of warning of what was in store for him ensured that each apprentice paid close attention to what the lecturer said, and made copious notes. The method of selection was deliberately not systematic, to prevent any prediction by individual apprentices.

**Objectives of the Experiment**

The use of public speaking, committee work, etc., to train apprentices in self-confidence, responsibility and clear thinking, is not in itself new. The novelty of this experiment is its integration, its economy and the many things accomplished in a short time span. There was, for example, much dissemination and absorption of fundamental technical information. The substance of the technical lectures given by the executives has been preserved for future apprentices by means of the printed précis. Many of the executives concerned have had copies of the précis to keep for trainees other than apprentices who may pass through their departments.

There has been a gain, too, in human relations. Appren-

(*Continued on page* 813)

*Education Officer, British Timken Division, The Timken Roller Bearing Company.

tices have been brought into intimate contact with very senior officials of the company. They have learned something of the adult philosophy of each successful executive as he talked about himself and the work his department is doing. They have worked with executives in preparing the chairman's notes, or the précis of the executive's lecture.

The senior apprentices' class itself has had an educational influence upon its own members. The craft apprentice has learned to respect and value the theoretical approach of the graduate engineer. The graduates have noted with interest the practical common sense and grasp of detail of the craft apprentices. Potential draughtsmen have mingled with potential toolroom engineers. Commercial apprentices have discussed technical topics, and technicians have been forced to consider commercial points of view.

The senior class undoubtedly contains some of our future supervisors and executives. We believe that they will be a better team 10 years hence, as a result of their new understanding of the other fellow's viewpoint, than they would have been if they had not taken part in this experiment.

As a follow-up to this lecture-series, an apprentices' essay competition has been organized. Four prizes of £10 each have been offered for the four best essays submitted on our manufacturing processes—under the following headings: 1, machining; 2, grinding; 3, press-work and heading; 4, heat treatment. The essays must contain at least 3,000 words, and reach a definite conclusion, they must not be merely descriptive.

# 21st ANNIVERSARY OF MECHANICAL HANDLING ENGINEERS' ASSOCIATION

THE Mechanical Handling Engineers' Association held its dinner, dance and cabaret in the Lancaster Room of the Savoy Hotel on Wednesday, October 26th, 1960, at which there were present about 140 guests composed of representatives of members and their wives. The function is a biennial one, but on this occasion it was in the nature of a celebration of the 21st anniversary of the inauguration of the association.

There was an address of welcome by W. G. Picton (International Combustion Products, Ltd.), the President of the M.H.E.A., followed by a toast to the ladies given by W. Morland Fox (W. J. Jenkins & Co., Ltd.), the Vice-President of the Association, to which Mrs. W. G. Picton replied.

In his address, Mr. Picton referred to the great strides which the association had made since its inception on March 1st, 1939. He said it was unfortunate that the year of the inauguration of the M.H.E.A. coincided with World War II, but it had been decided, very wisely as events had proved, that the functions of the association should be carried on in their entirety during the period of hostilities. The war brought in its train additional responsibilities and problems to the industry and one of the first measures adopted by the association was the appointment of a War Emergency Committee to keep in touch with the various matters which affected the mechanical handling industry arising out of war conditions.

The president continued by saying that the association very quickly established itself and the various Government departments were thus provided with an important source of contact with the industry. It was also interesting to note that the association had now become accepted in many parts of the world as the focal point for the British mechanical handling industry. The M.H.E.A. had, during its 21 years of operation, proved of considerable value to all those concerned in the industry and the chairman referred particularly to the spirit of goodwill engendered among members which had survived many challenges.

Mr. Picton said that it would be true to say that much was owed to those pioneers who had been responsible for the administration of the association in its early and formative days. There had been, of course, the late Mr. F. Lonsdale (Fraser & Chalmers Engineering Works), who had been the first chairman of the association and who had held office until the end of 1946. The president then referred to the eminent personalities who had constituted the executive committee at the outset of the association's activities and he said that he was particularly delighted to welcome the presence, on the occasion of the association's 21st anniversary, of three members of the original committee who had served through the two decades of the association's existence and who were still very actively engaged in the work of the association. They were Mr. B. C. Morton (Robert Dempster & Sons, Ltd.), Mr. D. Cherry Paterson (Paterson Hughes Engineering Co., Ltd.), and Mr. H. F. Shields (British Ropeway Engineering Co., Ltd.), who had also had conferred upon them the status of honorary members of the M.H.E.A. in recognition of their services to the organization.

Mr. Picton also took the opportunity of referring to the great qualities of those personalities who had followed Mr. Lonsdale and had preceded him in office and they had been the late Mr. L. Shaw Davis (Babcock & Wilcox, Ltd.), Mr. B. C. Morton (Robert Dempster & Sons, Ltd.), the late Mr. W. Ralph Purnell (The New Conveyor Co., Ltd.), Mr. D. Cherry Paterson (Paterson Hughes Engineering Co., Ltd.), Mr. H. F. Shields (British Ropeway Engineering Co.,

*Three of the original members of the first executive committee of the Mechanical Handling Engineers' Association, all past presidents. Left to right: H. F. Shields, O.B.E. (British Ropeway Engineering Co., Ltd.); B. C. Morton (Robert Dempster & Sons, Ltd.); D. Cherry Paterson (Paterson Hughes Engineering Co., Ltd.)*

*Mechanical Handling Engineers Association (Executive Committee), left to right: D. G. Anderson (Rownson Conveyors, Ltd.); B. C. Morton (Robert Dempster & Sons, Ltd.); D. Cherry Paterson (Paterson Hughes Engineering Co., Ltd.); W. Picton, President of the Association (International Combustion Products, Ltd.); seated: H. F. Shields, O.B.E. (British Ropeways Engineering Co., Ltd.); H. G. Harwood (Hugh Wood & Co., Ltd.); F. S. Stent (Babcock & Wilcox, Ltd.); L. A. Collis (J. Collis & Sons, Ltd.); L. Brook (Simon-Carves); W. Morland Fox, Vice-President (W. J. Jenkins & Co., Ltd.); J. F. R. Mitchell (Mitchell Engineering, Ltd.); D. Jackson (Mayor & Coulson, Ltd.)*
*Two members of the Executive were absent: I. Hey, immediate past President (Simon Handling Engineers, Ltd.), and Lt.-Col. V. Ward (Strachan & Henshaw, Ltd.)*

Ltd.) and Mr. I. Hey (Simon Handling Engineers, Ltd.). He expressed his extreme sorrow that Mr. I. Hey had, due to illness, been prevented from joining in the celebrations.

The president also paid special tribute to the executive committee, the technical committee, the film sub-committee and other bodies within the association who had rendered such signal service in the interests of the industry.

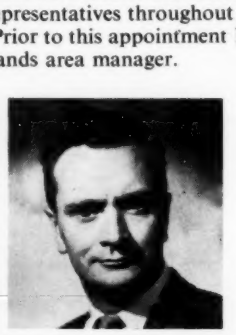
The president said that it would be difficult to forecast what the future held for industry but, whatever the challenge, it was essential that the association should continue to function effectively as it had done in the past. He added that he could not emphasize too strongly that the spirit of goodwill which had been created within the association over the period of time should always be maintained unimpaired. This rather abstract thing, said the president, was not easily defined nor easily acquired but it was the very mainspring of any successful organization.

In closing his address the president welcomed all the delegates and the ladies to this rather special function and he said that members could be particularly proud of the record of achievements by the association since its inauguration.

# NEWS OF PERSONALITIES

Square D, Ltd., announce the appointment of **A. S. Paice** as their export co-ordinator based at their Swindon headquarters. The ever-growing world acceptance of the company's products has necessitated this new appointment and Mr. Paice will liaise with, and co-ordinate the activities of, the company's agents and representatives throughout the Commonwealth and Europe. Prior to this appointment Mr. Paice was the company's Midlands area manager.

*A. S. Paice*

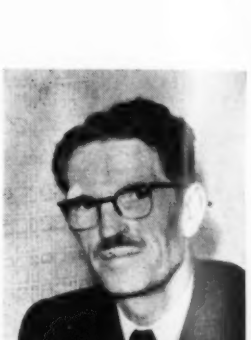


*R. Ritchie*

Taking up the vacancy of Midlands area manager is **R. Ritchie,** who was previously a field engineer operating from the company's Manchester office.

The Institution of Production Engineers, in pursuit of its policy of encouraging interest in the science and techniques of materials handling amongst production engineers, has recently set up a Materials Handling Group in the London area under the chairmanship of **L. W. Bailey.**

The Institution has, for several years, had a successful Materials Handling Group in Birmingham and it is expected that the new London Group will shortly be followed by the formation of other groups in the major industrial centres.



*L. W. Bailey*

Membership of these groups is confined to members of the Institution, but many of the activities sponsored by them will not be limited to members only.

L. W. Bailey serves on several committees of the I.P.E. and is well known to many readers of this journal as a consultant on materials handling, being the managing director of L. W. Bailey & Partners, Ltd.

Richard Sutcliffe, Ltd., of Horbury, announce the appointment of **A. H. Holmes, A.C.A.,** as secretary of the company in succession to E. Crome, who will in future devote more of his time to group activities.

Mr. Holmes, who is already a director and also secretary of Sutcliffe Hydraulics, Ltd., has been with the company almost seven years during the last four of which he has been chief accountant. He received his earlier training with Deloitte, Plender, Griffiths & Co.

Mr. Crome, who will continue as financial director of the company, is also a director of Craven Electronics, Ltd., Sutcliffe Engineering Components, Ltd., and Sutcliffe Plant Hire, Ltd.

**David Crichton** has been promoted from advertising manager to sales-promotion manager for Caterpillar

*David Crichton*

*Peter Whincup*

Tractor Co., Ltd. In this appointment he succeeds J. J. Irwin, who recently returned to the United States to take up another assignment with the parent company, Caterpillar Tractor Co., Peoria, U.S.A. In his new capacity Mr. Crichton will be responsible for advertising and sales training functions for the company. These previously have been separate divisions within the sales department, but now are re-organized to form the sales-promotion division of the sales department.

Richard Sutcliffe, Ltd., announce the appointment of **Peter Whincup** as manager of their Mining Division. Mr. Whincup was born in Yorkshire but was educated at the Boteler Grammar School in Warrington. Upon leaving school he joined the Wigan Coal Corporation as an apprentice and at the time of nationalization was assistant manager at Clock Face Colliery. In 1947 he was appointed manager and he remained at Clock Face until 1950 when he became manager of Sutton Manor Colliery. In 1957 he was appointed group manager of the No. 2 Group (St. Helens area) of the North Western Division. Mr. Whincup is a past president of the Lancashire branch of the National Association of Colliery Managers.

**J. S. Brough, M.I.Chem.E., M.I.Mech.E., M.Inst.F., F.Inst.Pet.,** has been appointed to the Board of Directors of Mono Pumps, Ltd., as assistant managing director. Mr. Brough's entry into the engineering and chemical fields commenced at the Manchester College of Technology and during his long association with these industries he filled appointments as chief engineer and general manager of production at Monsanto Chemicals, Ltd., and technical director of Humphreys & Glasgow, Ltd.

*A. E. Inglis*

*E. Kavanagh*

**A. E. Inglis, B.Sc.(Eng.),** has recently been elected a director of Paterson Hughes Engineering Co., Ltd.

**E. Kavanagh** has joined the Sales Division of Michigan (Great Britain), Ltd., as sales representative for the East Anglian area. Mr. Kavanagh was previously with E. Boydell & Co.

Materials Handling Equipment (Great Britain), Ltd., announce that **R. O. Burton** has been appointed home sales manager. Mr. Burton is well known in the industrial truck industry having spent 14 years in executive positions with I.T.D., Ltd., as publicity manager, home sales manager, and sales commercial manager. He is based at the London offices at 40a Dover Street, W.1, where he will be pleased to welcome his many friends in mechanical handling circles.

**R. L. E. Keates,** who was until recently home sales director of Steels Engineering Products, Ltd., only, has joined the boards of R. H. Neal & Co., Ltd., and F. Taylor & Sons (Manchester), Ltd. He now leads the home sales organization of the three companies which form the Steel Group of crane and excavator manufacturing companies.

Mr. Keates joined Steels in 1946 as a technical sales executive on the Coles crane sales staff in the London area. In 10 years he was progressively promoted to home sales director and now, four years later, becomes a director of Neals & Taylors in a similar capacity.

*R. L. E. Keates*

*R. Cooke*

**R. Cooke, B.A.(London), M.I.Ex.,** has been appointed managing director of the recently formed British Crane Co., Ltd., which has its headquarters in London. This company is part of the export organization of the Steel Group of crane and excavator manufacturing companies which produce Coles, Neal and Taylor-Jumbo cranes, and Neal-Unit excavators. Mr. Cooke first joined R. H. Neal & Co., Ltd., in 1947 as an assistant in the overseas sales department having spent six years as a lieutenant in the Royal Navy. Later he became assistant export manager which was followed by a period as export manager before being made general sales manager. In 1957 he was co-opted on to the board as sales director, a position he held when Neals became a member of The Steel Group of Companies. In addition to being made managing director of The British Crane Co., Ltd., Mr. Cooke has also joined the boards of Steels Engineering Products, Ltd., and F. Taylor & Sons (Manchester), Ltd., the other two firms in the three-company crane group.

**H. P. Barker, M.Inst.Gas.E., M.I.E.E., M.I.Mech.E., M.Inst.T., F.B.I.M.,** chairman and managing director of Parkinson Cowan, Ltd., was elected chairman of the British Institute of Management at the Annual General Meeting held in London recently.

**Alan S. Gill** has retired from the Board of George Cohen Sons & Co., Ltd., on attaining the age of 65, and will practise as an industrial consultant.

News of a new sales and service organization for the John Deere-Lanz industrial range of tractors and equipment has just been released by John Deere-Lanz A.G., Mannheim. From October 1st, last, a new company, J. D. Tractors, Ltd., Maidenhead Road, Windsor, Berks, will be the sole importers of John Deere-Lanz equipment for England and Wales in place of H. Leverton & Co., Ltd., and Fred Myers, Ltd., who have withdrawn to enable greater concentration on

their other interests. Considerable progress has already been made in establishing a network of authorized dealers and sub-dealers for sales, parts and service.

The director in charge of this new organization will be **Paddy Fleming,** a well-known figure in building and civil engineering circles, with a wide experience of earth-moving machinery. To assist him in the Midlands and the north of England will be **Guy Dixon,** also a director, and equally well known in the industry. On taking up their new appointments Mr. P. E. Fleming and Mr. A. E. G. Dixon have resigned their present positions with Fred Myers, Ltd., and H. Leverton & Co., Ltd., respectively.

Other Fred Myers, Ltd., executives who have resigned to take up new appointments with J. D. Tractors, Ltd., are **P. L. Richards, A.M.I.Mech.E.,** the new parts and service manager, and **A. H. Holt,** the new sales manager.

For the time being the headquarters of this organization will remain in part of the premises of Fred Myers, Ltd., Maidenhead Road, Windsor, Berks.



*P. E. Fleming*

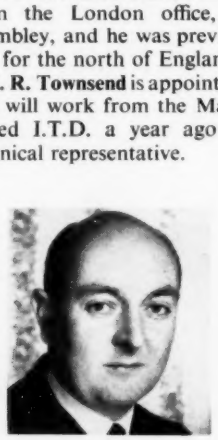


*A. E. G. Dixon*

Two further important promotions are announced by B. A. Christie, managing director of I.T.D., Ltd., manufacturers of 'Stacatruc' fork lift trucks. These appointments are subsequent upon other organizational changes announced on March 1st, 1960, when Mr. John Lowe became home sales manager and Mr. H. C. Hinder became export sales manager.

The new appointments are as follows: **P. O. Richards** to be southern area branch manager. Mr. Richards will work from the London office, Water Road, Abbey Estate, Wembley, and he was previously technical area representative for the north of England and later in the London area.

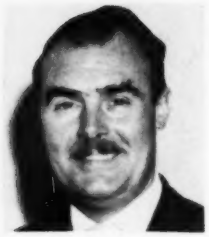
**K. R. Townsend** is appointed northern area branch manager and will work from the Manchester office. Mr. Townsend joined I.T.D. a year ago and has been Midlands area technical representative.



*P. O. Richards*

*K. R. Townsend*

Munck Engineering, Ltd., which was formed a few months ago, is the wholly-owned subsidiary of Munck International A/S of Bergen, Norway. The latter company are manufacturers of electric hoists, cranes, lifts, mechanical handling systems and V.H.F. remote-control equipment, and for the past 35 years have been exporting their products throughout the world.



*S. S. Godfrey*

The new company has been formed in the United Kingdom in order that the experience of the parent company may be made available to present and future customers in addition to providing an after-sales service.

The directors of Munck Engineering, Ltd., are O. A. **Munck,** chairman; **S. M. K. Munck, T. A. Munck** and **F. J. Munck, S. S. Godfrey, A.M.I.E.E., A.M.A.I.E.E.,** has been appointed general manager. The registered offices are 30 St. James's Square, London, S.W.1.

Mr. S. S. Godfrey saw service with the Royal Engineers as a major and has been the works management and chief electrical engineer to Sir Lindsay Parkinson & Co., Ltd. He is responsible for all Munck products in the United Kingdom.

**Ernest Bealing,** managing director of Sandvik Steel Band Conveyors, Ltd., of Birmingham, since 1946, is retiring at the end of this year, but is remaining a director of the company. He served his apprenticeship with Spencer (Melksham), Ltd., where he was a fitter, erector, draughtsman and resident engineer. For 10 years, he was north-eastern representative and, finally, he was London representative when he resigned after 31 years' service to take up his present position.

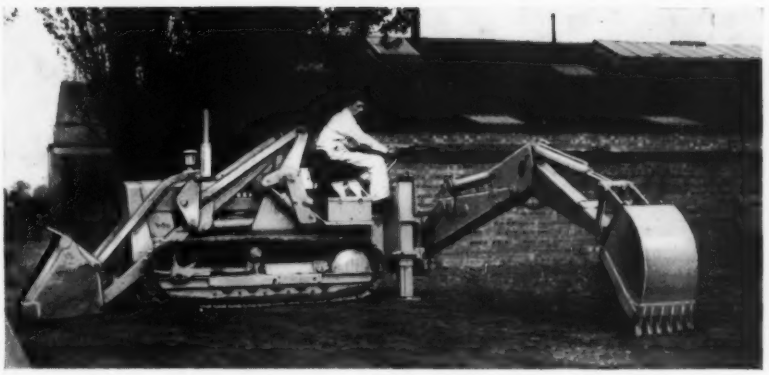
*E. Bealing*

*V. C. Price*

Mr. Bealing is currently chairman of the Midland Branch of the Institution of Mechanical Engineers (of 4,700 members) and his chairman's address to be given in Birmingham on Thursday, December 8th, will be based on 45 years of mechanical handling. He has been a member of the American Society of Mechanical Engineers since 1936, he is a past chairman of the Midland Branch of The British Institute of Management, is a member of The British Standards Institutes Committee on Conveyors and Elevators and he has written, lectured and broadcast on mechanization.

**V. C. Price** has been appointed as Mr. Bealing's successor. He has been in the Mechanical Handling Industry for 22 years, having served his apprenticeship with The New Conveyor Co. He has been with 'Sandvik' for 13 years and in recent years has been responsible for sales.

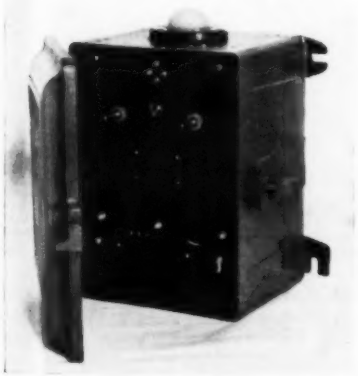
# REVIEW OF NEW EQUIPMENT



*A John Deere-Lanz 440 crawler tractor equipped with an 831 excavating loader and 51 backhoe*

### AUTOMATIC LIGHTING CONTROL

For the automatic control of lighting or other electrical circuits, the new Londex photo-electric switch operates in relation to the amount of daylight, which is a more satisfactory method than control by a time switch which does not take into account natural lighting conditions. There are two models, DCR 1 and DCR 2, with adjustable ranges of 0·2 to 50 and 2 to 50-ft candles, respectively. New features include printed circuit mounting of components, independent adjustment for 'lights on' and 'lights off' levels, a circuit stabilized against mains voltage fluctuations and delayed operation to ensure switching only on maintained light changes. Light falls on to the photo-electric cell through a frosted glass dome on top of the cast-iron casing, causing contacts to operate about 30 seconds after it has decreased or increased to the levels set on the controls. The delay period can be cut out by a switch when required. The output relay has contacts rated at 3 amp at 250 V A.C. This can be increased by use of a mercury switch relay up to 60 amp T.P., 250 V A.C.



*The Londex DCR automatic control unit for lighting and other electrical circuits*

### CRAWLER TRACTOR AND INDUSTRIAL EQUIPMENT

Fred Myers, Ltd., Maidenhead Road, Windsor, are now the sole distributors in Southern England and South Wales of the John Deere-Lanz crawler tractor and industrial equipment manufactured by John Deere Intercontinental S.A. in the United States but assembled on to the tractors which are made in their Continental factory operating under the name of John Deere-Lanz A.G. at Mannheim, Germany. The John Deere-Lanz 440 crawler tractor is designed for industrial use and, with special mounting brackets, pads and milled surfaces to take a wide variety of equipment, becomes the mobile power unit for a complete excavating, trench digging, bulldozing, loading, transporting, pipe-laying, lifting or hoisting machine.

Tractor features include a Perkins P3/144 3-cylinder 32-h.p. diesel engine, single-disc clutch, four-speed forward and reverse gearbox, with optional direction reverser, clutch-brake controlled steering, rear power take-off for operating equipment, optional belt pulley attachment, optional 3-point hitch for speedy changing of equipment and choice of track shoes for all conditions.

Equipment items are the 602 angling bulldozer, with blade 7 ft 6 in long, 23 in high and having straight forward, and 25-deg left or right positions; the 51 five-position hydraulically-operated backhoe, with over 20 ft reach, 11 ft loading height, 13 ft 6 in digging depth and 17,500 lb pry-out force; the 831 loader, with 7-8 cu. yd. digging bucket, with optional bucket teeth, 35-deg bucket roll-back at ground level and 8,500 lb breakout force; power take-off stub shaft, connected to the splined shaft in the transmission, for operating various machines; the 831A scarifier, with three or five teeth, supplied with the 831 excavating loader; and the 300 sideboom crane, with hydraulic motor-driven winches, hydraulically controlled counterweight and lifting capacity of 1,200 to 4,000 lb.

### FOUR-WAY FLEXIBLE COUPLING

Known as the Quadriflex, a new coupling accommodates angular misalignment up to 1 deg, parallel misalignment up to $\frac{1}{16}$ in, depending upon shaft size, free end float up to $\frac{1}{8}$ in, depending upon coupling size, and vibrating, uneven and shock torsional loading. It has 15 deg torsional flexibility at peak torque. Of simple design, it consists of two flanges and a two-piece flexible rubber sleeve. The teeth of the sleeve halves lock into the teeth of the flanges, without clamps or screws, and tighten under torque. The coupling is easily installed and is unaffected by abrasives, dirt or moisture. There is no metal-to-metal contact, and absence of wear eliminates the need for lubrication or maintenance. No destructive overhung loads are placed upon driving or driven shafts, thus assuring longer bearing and shaft life. Angular or parallel misalignment does not generate unbalance or pulsations as all flexing takes places within the rubber sleeve.

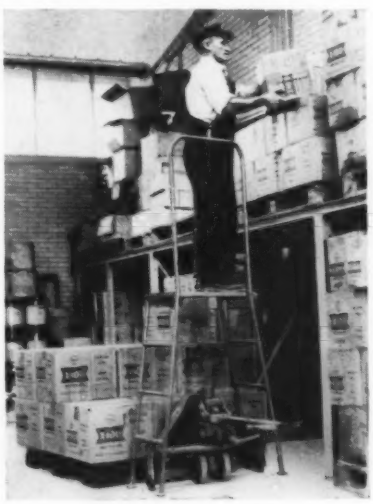
External finish is smooth, and there are no protruding nuts or bolts to cause injury or catch on clothing. The rubber sleeve acts as an electrical insulator between the driving and driven units. For installation it is only necessary to slide the flanges on to the shafts, fasten one in place, insert the two-piece flange in place and fasten. Alignment can be checked with a straightedge placed across the outside of the flanges. A retaining ring is supplied for high-speed operation.

Manufacturers are R. & J. Dick, Ltd., Greenhead Works, Glasgow.

### SPRING-LOADED STORES LADDER

To facilitate selection of orders in stores, G. Hunter (London), Ltd., Gumley Road, Grays, Essex, have produced a spring-loaded ladder fitted to a hand pallet truck. Features of the truck include a

*The new Hunter pallet truck fitted with a spring-loaded stores ladder*

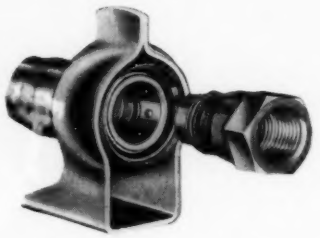


special design of pump unit. The pump ram works without a washer, obviating maintenance, and an interchangeable pump cylinder inside the oil reservoir eliminates leakage. Ball and tapered roller bearings are used throughout, and fork rollers are available in steel, rubber, nylon or aluminium. It is stated that 7,000 of these trucks have been exported to the U.S.A. during the last twelve months.

### PAPER REEL LIFTING DEVICE

A 50 per cent saving in man-hours is attributed to the use of the new B.E.R.L. lifting device by International Computers & Tabulating Machines, Ltd., Letchworth, for unloading 10-cwt paper reels from railway wagons. Seven reels loaded horizontally in each wagon are cleared by three men in 20 minutes, whereas previously the same operation occupied five men for 25 minutes, thus saving one in every two man-hours on each load. The device also facilitates the rapid turn-round of railway wagons and road vehicles, permitting these and the mobile crane to be utilized to greater advantage with considerable economies in time and fuel costs. The device, which was shown at the recent Mechanical Handling Exhibition by British Electrical Repairs, Ltd., Manchester, is designed to eliminate hazards associated with manual handling of paper reels and damage to them by mishandling. The reels can be handled in both vertical and horizontal positions. At Letchworth they are transferred from the horizontal travelling position to the vertical as required for delivery.

The B.E.R.L. device is suspended at an angle of about 45 deg from a mobile crane and is guided into the borehole of the paper reel. It is inserted until checked by a reaction plate, and the crane hook is slightly overlowered so that the device is supported by the reel. Unlocking mechanism is then operated and, as the crane hook is raised, torque shafts within the borehole are rotated in needle roller bearings, expanding steel cams that grip the inside of the borehole. The reel is then lifted. When the crane hook is slightly overlowered on landing, the device is automatically released and hoisted clear for the next lifting operation.



*The Aeroquip quick-release self-sealing hydraulic hose coupling with mounting bracket for fixing to a tractor or other towing vehicle*

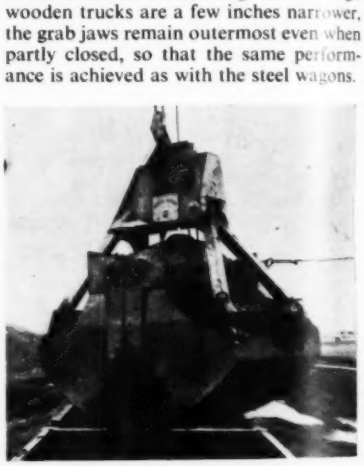
### QUICK-RELEASE SELF-SEALING COUPLING

An addition to their range of Aeroquip flexible hose and end fittings is announced by Super Oil Seals & Gaskets, Ltd., Factory Centre, Birmingham, 30. This is a quick-release self-sealing coupling for hydraulic feed lines of up to 3,000 lb/sq. in. working pressure. It is manufactured with British standard or American threads and, by the use of adaptors, is available in $\frac{3}{8}$-in and $\frac{1}{4}$-in sizes. Designed for general industrial and agricultural equipment, for the latter a mounting bracket permits it to be fixed to a tractor or other towing vehicle. One half is held by the bracket but the other half is free to disengage automatically should an unexpected pull be applied to the hose line, so that hose and coupling are safeguarded from accidental damage. Without the bracket, the coupling is self-sealing on disconnection.

The coupling consists of two halves, each using a spring-loaded poppet sealing valve and spring-loaded thimble ring for quick attachment. When connected, the halves of the coupling are sealed with a rubber sealing ring and held in position by hardened steel balls working in tapered location holes. Tests show that there is negligible restriction to the flow of hydraulic fluid through the coupling.

### SELF-TRIMMING GRAB

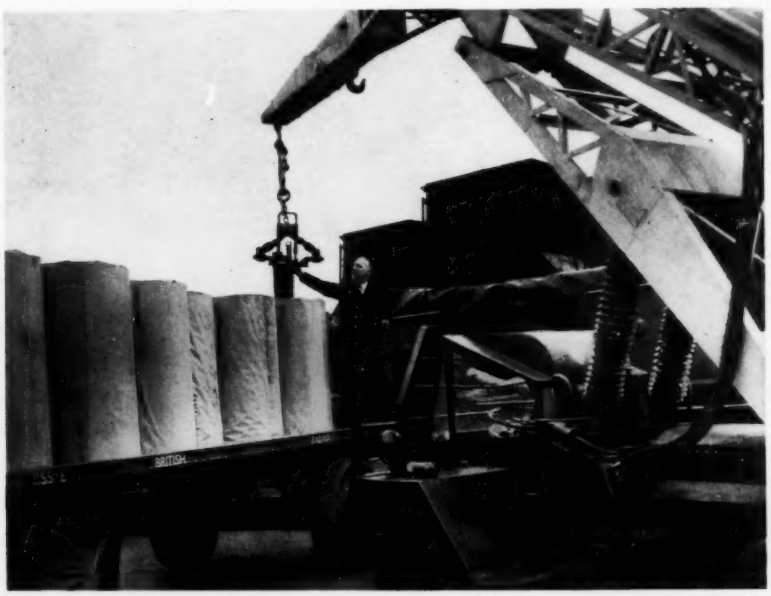
A grab which completely obviates hand trimming when unloading railway wagons is being manufactured with capacities up to 3 cu. yd. by Michael & Partners, Ltd., Chesterfield. The $1\frac{1}{2}$-cu. yd. model has been specifically designed for unloading British Railways' standard steel wagons, rendering the use of cleaning doors unnecessary. It is completely free from projections in the open position and able to reach into all square corners. When it is fully open the jaws are vertically parallel and measure 7 ft $11\frac{1}{2}$ in across, so that they can slide exactly down the 7 ft $11\frac{1}{2}$ in inside width of a steel wagon. Although wooden trucks are a few inches narrower, the grab jaws remain outermost even when partly closed, so that the same performance is achieved as with the steel wagons.



*Unloading of railway wagons with the new self-trimming grab manufactured by Michael & Partners, Ltd.*

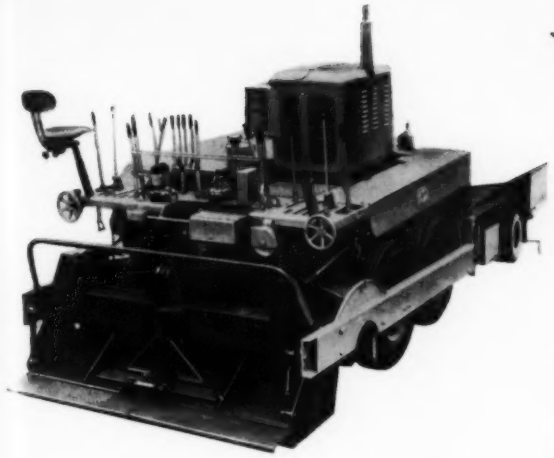
Essentially it is a digging grab. Owing to the receding radius of its jaws, it tends to pull itself into the stock, so that it digs throughout the closing stroke and lifts a full load every time. The jaws are geared together to give consistent, smooth closing. Two $1\frac{1}{2}$-cu. yd. grabs have been regularly unloading 140 tons of small coal in an hour. This rate is equivalent to that of a tippling unit costing about 20 times as much as the two grabs. One grab will completely empty 14 tons of slack coal from a steel railway wagon in 15 to 18 bites.

*Loading paper reels from a railway wagon on to a lorry with the B.E.R.L. paper reel lifting device at the British Railways goods depot, Letchworth*



### BLAW KNOX PAVER IMPROVED

Improvements in the design of the BF-90 paver are announced by Blaw Knox, Ltd., 94 Brompton Road, London, S.W.3. Better visibility from each operating position and easier access to working parts are afforded. The fuel tank, now concealed below the deck plating, is



*Right: The V.M.E. Portaband portable belt conveyor*

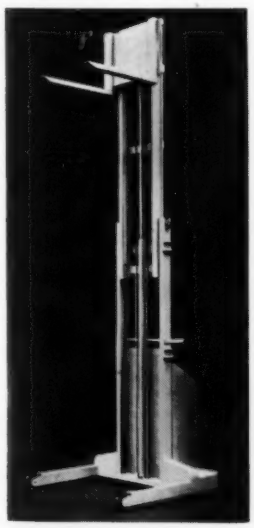
*Left: Many improved features are incorporated in the construction of this latest type Blaw Knox PF-90 paver*

protected from damage and, being mounted at convenient height, it is easy to fill from drums by means of a built-in semi-rotary pump, which is standard equipment. Fuel filters are repositioned for easier maintenance, and the battery and toolboxes are more readily accessible below the sloping sides of the hopper. The life of the screw feed has been lengthened by new hard facing materials and greater area of treatment. Shrouded-type bearings prevent entry of dust and grit.

The hopper gates are now controlled by a sturdier and more easily operated screw adjustment, giving positive control of the flow of material to the screw feed. The firebox of the screed heater is more robustly constructed, and an improved motor and impeller make for better heat control and greater reliability. More efficient brakes of greater capacity give improved steering and higher accuracy when paving around small radius curves. The price remains the same.

## TELESCOPIC STACKER

Powell & Co., Burry Port, Carms., South Wales, have recently added a telescopic mast stacker to their range of *Vertolifter* hydraulic elevator trucks. Designed to lift 1,500-lb loads to 12 ft it is manually propelled and has an hydraulic lifting unit with pump operated either by a battery motor or mains-electric motor taking single- or three-phase current. With masts of heavy-gauge steel channel, it can be used in confined spaces in place of larger and more expensive lift trucks. The forks are 30 in long and the carriage has side thrust as well as guide rollers. Other features are twin-roller type lifting chains, 6-in dia floor wheels and all rollers, wheels, chain pulleys, etc., have needle roller bearings. The outrigger legs are 43 in apart, sufficient to straddle 40-in pallets. The overall height is 96 in when the masts are lowered. Later 8-ft and 10-ft lift models will be available.



*Left: Loads up to 1,500 lb can be raised to heights up to 12 ft with this telescopic stacker recently added to the range of Vertolifter trucks*

## PORTABLE BELT CONVEYORS

For loading and unloading vehicles, interfloor conveying and other handling operations, V.M.E. Conveyor & Furnace Ltd., 1026-1028 Harrow Road, London, N.W.10, have introduced the *Portaband* portable belt conveyor, of robust construction though light enough for easy movement. An adaptation recommended for rough and heavier handling is the Portaslat, on which the belt is replaced by side chains fitted with timber or steel slats. A further adaptation is the *Portatrough* fitted with a trough belt suitable for handling coal, stone, slate, etc.

All models are powered by a ¾-h.p. electric motor, have a working speed of 60 ft per minute, or to customers' requirements, and maximum inclination angle of 40 deg. Raising and lowering is effected by a hand-operated hydraulic pump, and the maximum load is 2 cwt.

## INTERMITTENT GROSS WEIGHER

Designed automatically to record the weight of material carried over an aerial ropeway conveyor system, the Adequate intermittent gross weigher, produced by Adequate Weighers, Ltd., Bridge Works, Bridge Road, Sutton, Surrey, requires no attendant operator and does not halt the flow of containers at any stage. It comprises a lever system with pendulum resistant, pendulum clamping device and an Adequate integrator incorporating gear mechanism to isolate the totalizer when required.

In operation, a skip carriage moves on to a weigh rail suspended from two tubular levers. The load applied to the weigh rail is transmitted by two power arms to a further single lever projecting at right angles and is in turn transmitted to a connecting rod which transfers it to a further lever system incorporated with the recording mechanism, normally at ground level. The resultant force of the lever system is applied to the pendulum resistant. Pivot points take the form of knife edges and bearings, and lever designs vary to suit requirements. The pendulum carries a fork which controls the lateral movement of the steel ball drive in the integrating machine.

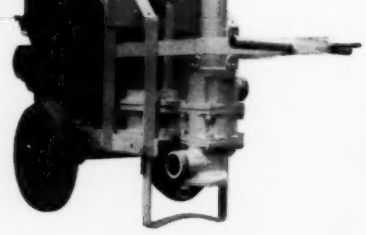
As soon as a skip is fully on the weigh rail, it trips a switch which first releases the clamping mechanism on the pendulum,

*Right: The Adequate intermittent gross weigher which will automatically record the weight of material carried over an aerial ropeway conveyor system*

allowing it to adjust itself to the weight of the skip, and then starts a time relay mechanism. Before the skip moves off the weigh rail, the time relay mechanism operates the clamping mechanism to hold the pendulum at the position indicating the weight of the skip. A fraction of a second later it starts the recording cycle. The gear mechanism engages the totalizer with the continually running integrating mechanism for the precise period of time required to record the weight of the skip. Whilst the gear mechanism disengages the totalizer as soon as the weight is registered, the pendulum resistant remains held firm at the position indicated by the last weight until the next skip releases the mechanism. Thus the lever system has only to adjust itself to the change in weight of successive skips and does not have to move from zero to load each time. The mechanism can be arranged to allow for the tare of empty skips, but it is a major problem to tare all skips to the same weight and ensure clean discharge. It is, therefore, recommended for maximum accuracy to install two weighers, one before and the other after the loading point.

## IMPROVED MUD PUMP

Many improved features have been incorporated in the design of the new Mark 4 mud pump manufactured by C. H. Johnson (Machinery), Ltd., Adswood, Stockport, giving a maximum output of 3,600 g.p.m. and heads up to 80 ft. The gearbox is flange-mounted to a steel plate member above the pump chamber instead of being foot-mounted as previously. This greatly strengthens the mounting, and the pump stroke has been reduced, increasing diaphragm life. A new pump body has easy-clean anti-clog ball valves the chamber of which is cast on the pump body instead of being bolted on. Both suction and delivery elbows at one end of the pump have three optional positions so that the connections can be moved through 180 deg for convenience of installation. They are out of harm's way while towing but accessible for coupling-up purposes.



*The improved Johnson Mark 4 mud pump, which has a maximum output capacity of 3,600 g.p.m.*

The standard engine is the Lister LD.1 air-cooled diesel, but the Petter PAZ.1 diesel, Lister L type petrol or Villiers light weight air-cooled petrol engines are available. Electric drive can be provided, and the pump can be mobile- or stationary-mounted. The mobile unit is normally mounted on two wheels and has a tow hitch for towing or manhandling. A lifting eye is also provided at the point of balance for easy slinging.

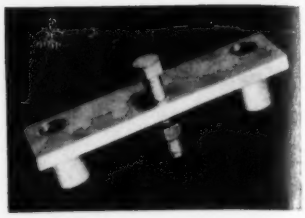
*A recent production of Pye, Ltd., is this new 6-kW induction heater*

## NEW INDUCTION HEATER

Suitable for general-purpose heating applications, such as annealing, brazing, hard and soft soldering, hardening and tempering, the new 6-kW induction heater produced by Pye, Ltd., 28 James Street, Cambridge, is of medium impedance output. The availability of a high work coil kVA in association with multi-turn coils permit the heating of a wide range of ferrous and non-ferrous loads. The oscillator valve may be either the air-cooled Type R.F.3/A or water-cooled Type F.R.3/W, depending upon requirements. The controls, indicator lamps, anode current meter and process timer are conveniently grouped on the front panel. Occupying only $25\frac{1}{2} \times 23\frac{1}{2}$-in floor area, the equipment is self-contained with its own automatic resetting process timer, overload relay to protect the valves and provision for remote control. It is designed to be operated from a 3-phase 360-440-V 50-c/s supply with a full-load consumption of 12·2 kW. Water consumption for the air-cooled version is 0·5 g.p.m., and for the water-cooled version, 2·5 g.p.m. Safety switches behind the movable panels and the components are easily accessible for servicing.

## CONVEYOR BELT TENSIONER

The latest addition to the range of accessories available with the Junior Mayrath grain conveyor produced by Gordon Felber & Co., Ltd., Spirella House, Oxford Circus, London, W.1, is the patented Ideal belt tensioner. It is fitted to the legs of the motor mounting bracket with the short tubular sections, seen in the illustration, downwards. The head of the bolt presses against the top edge of the conveyor headplate and is



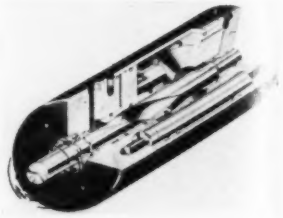
*The Ideal conveyor belt tensioner*

rotated clockwise until the desired tension on the belt is achieved, i.e. allowing approximately $\frac{1}{2}$ in of slack on the belt. The locking nut is then tightened to secure the tensioner in position. It enables the user of a Mayrath or similar conveyor to adjust the belt tension without having to lift the motor by hand.

## ROTARY TORQUE ACTUATOR

The improved Carter rotary torque actuator is now available in Great Britain through British Arca Regulators, Ltd., Sisson Road, Gloucester. It incorporates full cushioning in providing 0 to 370 deg of high-torque rotation. Powered by air, gas, water or oil, it seals dead tight and will not back off under tension, shock, vibration or power failure. It may be stopped at any point in the rotation cycle. Full cushioning provides smooth, controlled deceleration at the end of clockwise or counter-clockwise rotation cycle. An extra 5 deg at the end of either cycle gives the designer freedom to utilize full quadrants of rotation in all standard cycles. These standard cycles are 0 to 100 deg (full 90 deg with 5 deg over travel), 0 to 190 deg (full 180 deg), 0 to 280 deg (full 270 deg) and 0 to 370 deg (full 360 deg). Bore sizes available are 4 in, 6 in, 8 in, 10 in and 12 in.

Applications include positioning of all kinds, indexing cam actions, valve operations, swing motions, progressive turning, agitation, transfer mechanism, dumping, clamping, gate opening, rolling, lifting and maintaining constant tension. Rotary torque output ranges from near zero to 15,000 in/lb, depending on input pressure and bore size, and is made possible as the internal helix design and sealing prevent internal piston by-pass and external pressure leakage. For applications independent of outside power the actuator is available with built-in valving, attached pumps, motor and make-up reservoir. It is also available with built-in remote poppet or solenoid valves, foot and front or rear flange mounting. All parts are completely interchangeable for easy servicing.



*Cut-away illustration showing principal features of the improved Carter rotary torque actuator*

# TRADE NOTES

### Automatic Stone Coating Plant

An automatic stone coating plant, just installed by D. Davies & Sons (Dinas), Ltd., at Llansawel, near Llandeilo, Carmarthenshire, will provide material for road work and other projects in a large area of South Wales.

All of the operations performed by the plant can be pre-set for automatic operation and this, in addition to the saving of manpower effected by central control, gives a great degree of accuracy. The plant control panel, made by Brookhirst Igranic, is situated in the mixer house.

From the control console the operator pre-sets the proportions of materials delivered from the main storage bins by blender feeders which will meet any British specification or any specification to an average accuracy of two per cent.

Other features of the plant include a 46-cu. ft. capacity batch heater; a 4,000-lb paddle mixer; and two travelling mixed material hoppers which are situated beneath the paddle mixer.

All doors are air-cylinder operated and worked by solenoid valves connected to the Igranic control panel. The Parker, patent, 'Synchromix' bitumen metering and spraying system is fitted and filler, fed to the mixer by worm and elevator, is stored in a hopper just above ground level.

The material which the plant is handling is a hard abrasive quartzite with a very high polished stone coefficient. It is well known for its non-skid characteristics and its high resistance to polishing under heavy traffic conditions.

The plant, made by Frederick Parker, Ltd., of Leicester, England, was designed with the qualities of the stone in mind.

### Orders for Coal-conveying Plant

Birtley Engineering, Ltd., Birtley, Co. Durham (a member of the B.S.A. Group), has received orders worth over £100,000 for coal-conveying plant extensions at the Central Electricity Generating Board's power stations at Blyth 'B' (Northumberland) and West Thurrock (Essex).

The complete coal-handling plant for the Blyth 'A' power station was supplied by Birtley Engineering; the West Thurrock contract is additional to work already being carried out by the company at that power station.

### SRO Bearing Company (Sales), Ltd.

SRO Bearing Company (Sales), Ltd., the recently formed British sales organization of SRO Ball Bearing Works Schmid-Roost, Ltd., have now opened premises at 164 Camberwell Road, London, S.E.5. (Telephone: RODney 6222.)

SRO manufacture a wide range of sizes of ball and cylindrical, taper and spherical roller bearings to I.S.O. specification from special alloy steels produced in their own steel works. The close co-operation from the metallurgical point of view, plus ultra-modern production, inspection and test facilities in the bearing factory ensure the precision and efficiency expected from a Swiss product.

Having been established in 1894, the parent company have over half a century of practical bearing production experience as a background against which they operate the largest plant of its kind in Switzerland to-day. In addition to bearings, SRO Bearing Company (Sales), Ltd., offer an extensive range of split-type plummer blocks incorporating SRO bearings.

J. Brand has been appointed manager of the new company.

### Dowty Group, Ltd.

Dowty Group, Ltd. of Cheltenham, announce the following:

1. The name of the company, Dowty Nucleonics, Ltd., has been changed to Dowty Electrics, Ltd. This company will continue to design and manufacture aircraft and other electrical equipment. The company will operate from existing premises at Tewkesbury, Glos.

2. A new company has been formed under the title of Dowty Technical Developments, Ltd., to undertake advanced project work for the Dowty Group. The board consists of: Sir George Dowty, chairman; Mr. T. D. H. Andrews, managing director; Mr. D. G. A. Thomas, and Mr. J. E. Price, secretary.

The company will operate from Brockhampton Park, Andoversford, Glos. The new registration brings the total number of Dowty Group subsidiary companies to 22.

### Another Simms Acquisition

Fuel Feed and Injection, Ltd., Preston, Lancs., have been taken over by Simms Motor Units, Ltd., and will continue for a while to trade under their present name,

*Right: A £150,000 electronic computer is pictured on the hook of a Coles crane as it was hoisted 70 ft in the air to be manœuvred through a hole knocked in the wall of the fifth floor of Remington House, Holborn Viaduct, London, where a special air-conditioned room had been prepared for it. When the building was under construction a 'soft' wall was built into the fifth floor. This was knocked out to leave a 10-ft square hole through which the crane, with a 90-ft jib, lifted the machine, which weighs nearly 3 tons. The computer—an electronic 'brain'—is a Remington Rand Univac and is the first of its type in Britain*

*This automatic stone coating plant, made by Frederick Parker, Ltd., of Leicester, England, and owned by D. Davies & Sons (Dinas), Ltd., of Llandeilo, will provide surfacing material for road projects in South Wales*

offering branch facilities to Simms customers in that part of Lancashire north of a line from Banks to Shawforth. S. Castle, formerly Simms Commercial Vehicle Specification Representative in the London area, is appointed manager.

**Business Acquired**

C. H. Johnson (Machinery), Ltd., have acquired the entire business and premises of The Compressor & Demolition Co., Ltd., 70-74 Stewart's Road, Battersea, London, S.W.8. J. S. Mandel is retaining his position as director and manager, and C. Mandel is remaining in charge of the offices.

The Compressor & Demolition Co., Ltd., will retain and develop their existing services for the hire of their fleet of mobile and portable compressors and also their concrete demolition business, backed by a competent team of compressor operators.

An extensive stock of compressed air breakers, rock drills, hose and general tools is maintained for sale and hire, together with stocks of hose and other accessories. Workshop facilities are also available for the repair of compressors and pneumatic tools. Production for sale and hire of the hydraulic concrete cartridges will also be fully maintained.

**1961 John Morris Memorial Award**

British Industrial Truck Association is again offering as first prize in its annual competition a place at the Advanced Materials Handling Training Course to be held at Lake Placid, U.S.A., in June, 1961. In addition there will be cash prizes of £25, £15 and £10.

Candidates, who must be sponsored by their employers, will be required to write a paper on one of the following subjects:

1. How to organize a Materials Handling Training Course at advanced level in this country.

2. Consider a hypothetical problem in materials handling, e.g. starting up a new factory, giving suggested plant layout, showing internal materials movement and examining and answering the problems involved.

3. The design of warehouse and storage areas to allow efficient handling by industrial trucks, setting forth all the points to be taken into account when planning.

Requests for full particulars of the competition, the Lake Placid course and application form should be made to the Secretaries, British Industrial Truck Association, 94/98 Petty France, London, S.W.1.

## JANUARY

*Among the feature articles, this issue will contain the following:*

HIGH-SPEED BOTTLING OPERATION

METHODS OF HANDLING TO SUIT STORAGE AND PRODUCTION AT VACUUM CLEANER FACTORY

MECHANICAL HANDLING IN THE ASSEMBLY OF 15-CWT COMMERCIAL VEHICLES

A JET AGE BAGGAGE VEHICLE

AN ENTIRELY NEW FORM OF MATERIALS HANDLING IN BULK

AND USUAL FEATURES

*The first of the new British-made Caterpillar 955F traxcavators has been delivered to Taylor Woodrow Construction Ltd., by Fred Myers, Ltd., of London, and will be put to work as its first job on Taylor Woodrow's £¾ million Wentbridge by-pass contract, West Riding of Yorkshire. The picture shows: T. Reeves, joint managing director of Taylor Woodrow Construction, Ltd., receiving the 955F from A. N. Dixon, chairman of Fred Myers, Ltd., in Taylor Woodrow Plant Company's yard. Next to Mr. Dixon is L. R. Hammond, managing director of Taylor Woodrow Plant Co., Ltd., and on the far right D. A. L. McLarty, contracts manager for the Wentbridge project*

**Bid to Solve Problem of Skilled Labour Shortages**

The perennial problem which faces Midland industry, of obtaining sufficient numbers of skilled men for engineering work, is to be tackled by Yale & Towne's British Divisions at Willenhall and Wednesfield by the introduction of new training schemes.

John O. Sewell, managing director, announced this on making the appointment of Harold Warrilow as Yale & Towne's education and training supervisor. He said, 'Our new scheme goes much further than the usual apprenticeship scheme. It is open to all school-leavers, and is aimed at providing first-class practical training linked with further education'.

Implementing the training scheme will be Mr. Harold Warrilow. He comes to Yale & Towne from Accles & Pollock, Ltd., where he was assistant training officer. Earlier, he had served with Marston Excelsior (I.C.I.), Ltd., and as assistant youth employment officer in Wolverhampton, then as youth employment officer for Oldbury.

**G.E.C. Turbo-Blower for British Steelworks**

The General Electric Co., Ltd., has recently received an order valued at £139,000, for the supply and installation of a turbo-blower at the Cleveland Works of Dorman Long (Steel), Ltd. The new machine will be installed alongside two 90,000 c.f.m. blowers also supplied by G.E.C.

The blower, which is to supply air to blast furnaces, will be of the centrifugal type, having three impellers each of 66 in diameter running at speeds up to 3,200 r.p.m. The output at normal duty will be 100,000 c.f.m. against a pressure of 35 p.s.i.g. and at maximum duty 110,000 c.f.m. against a pressure of 40 p.s.i.g.

The drive will be provided by a steam turbine, direct coupled to the blower operating on steam conditions of 425 p.s.i.g. at 725 deg F. Condensing plant will be supplied by Mirrlees Watson, Ltd., of Glasgow.

**Demonstration of Side-operating Fork Lift Carriers**

By courtesy of J. F. Harrison, chief mechanical engineer British Railways Central Staff, and R. A. Smedley, chief mechanical and electrical engineer (Western Region), a demonstration of materials handling equipment was staged recently at the carriage and wagon works, Swindon, for officers from all regions of British Railways. H. C. Johnson, manager,

(*Continued on page* 823)

carriage and wagon works was unable to be present, so the visitors were welcomed by the assistant works manager, E. Butcher, who organized the demonstration in conjunction with Materials Handling Equipment (G.B.), Ltd., and A. W. J. Dymond, supplies and contracts manager (Western Region).

First of all the 'Irion' side-operating fork lift carrier with a capacity of 6,600 lb at 24-in load centres, which had been in active operation for many years, was shown carrying out normal work in the yard unloading long steel channel sections from rail wagons and transporting the loads to the storage areas where the driver unloaded and stacked the steel, using dunnage strips only. After this a British-made 'Kestrel' carrier of the same capacity, delivered to Swindon in January, 1959, was then seen under normal working conditions, picking up, stacking and transporting steel sections up to 63 ft in length from the storage area to the shops. This carrier is also being produced by Materials Handling Equipment (G.B.), Ltd.

The third exercise was to show the new Irion 'Lizard' battery operated side-loading reach truck, which can be driven sideways as well as forwards and backwards in 5-ft aisles and can pivot-turn in its own length. The various loads handled by the forks which have a spread from 32 in to 86 in includes steel sections, timber, wagon wheels, and also palletized loads.

Col. R. T. Hartmann, managing director of M.H.E. (G.B.), Ltd., introduced those members of his sales and technical staff who attended, viz.: R. O. Burton (home sales manager); R. J. L. Fish (P.R.O. and sales executive, London area); J. Brewer (sales Midland area); B. Giles (sales, Northern area); F. E. J. Smith (sales Western area), and R. G. Flower (service engineer).

### New Finishing Plant for John Bruce (Engineers), Ltd.

A completely automatic finishing plant, designed and installed by Parkinson Cowan Industrial Products, is now working in the impressive new motor components factory of John Bruce (Engineers), Ltd., at Oxford.

The product finishing plant takes the form of two discrete systems: one handles 1,750 pressed components per hour at a stoving cost of about 0·08d. each; the other system handles channel-formed components at the rate of 6,000 per hour, each component being stoved for about 0·02d. Two overhead conveyors, two gas-fired radiant heat stoving ovens and two paint tanks comprise the complete installation.

The main finishing line handling pressed components has a 122-ft overhead chain conveyor moving at a mean speed of 3 ft per minute and carrying jigs at 3 ft 6 in centres. Each component is loaded on to the jigs and makes two circuits of the conveyor route. The oven has an overall length of 21 ft with a heated area 15 ft long × 4 ft high and with 3-ft long sheet metal vestibules at each end.

When the conveyor carriers return to the loading point, pressed components which have been primed are moved to the other side of the jig so that their next circuit takes them through the finishing coat compartment in the paint tank. Unpainted components are put on the 'primer' side of the jig. After the next circuit, the original component is finished and replaced on the jig by the primed component. Another unpainted component is then mounted on the 'primer' side.

A similar layout is used for the channel-formed component finishing line except that only one coat of paint is required and therefore the paint dip tank has only one compartment.

### 1,000th British-built Michigan

Two and a half years ago the first British-built Michigan tractor shovel rolled off the line at Yorktown Works, Camberley, Surrey, only a few months after the decision to set up a manufacturing organization in Britain to build Michigan construction equipment, known throughout the world in the earthmoving and materials handling industries.

Twenty-one months later the production line had expanded to build six different tractor shovels and 500 British-built Michigans had been delivered to work in the United Kingdom and overseas.

The demand for Michigans has developed constantly and more and more orders have been received from a variety of industries, so that production at the Camberley factory has been increased again and again. In October, 1960, the 1,000th British-built Michigan left the line to be handed over to one of our major civil engineering contractors—Sir Robert McAlpine & Sons, Ltd.

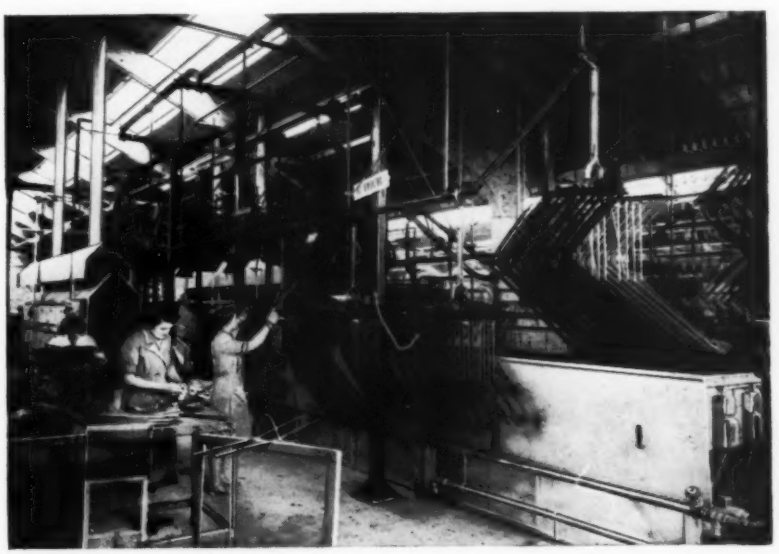
The six tractor shovel models in series production at Camberley range from 1 cu. yd. (6,000 lb) capacity to 8 cu. yd. (20,000 lb) capacity—all featuring the Michigan power train, which incorporates a torque converter, power shift transmission and planetary drive axles. The versatility of these tractor shovels is increased by the availability of a range of buckets, plus a variety of front end attachments for specialized applications such as fork lift, backfiller blade, crane hook, root rake, scarifiers, etc.

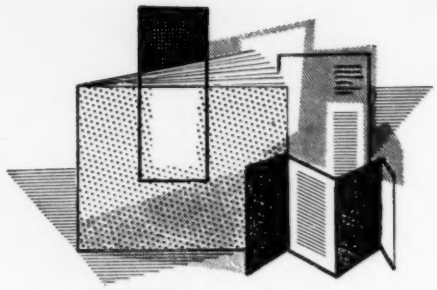
*The formal handing over ceremony of the* 1,000*th British-built Michigan. Held recently at the Dorchester Hotel, London, it shows (left) Mr. A. J. F. Andrews, managing director, Michigan (Great Britain), Ltd., and (right) Mr. Kenneth McAlpine of Sir Robert McAlpine & Sons, Ltd.*

In addition to the tractor shovel line Michigan (Great Britain), Ltd., have recently commenced manufacture of two models of the tractor dozer line, one of 147 h.p. and the other of 262 h.p. Both embody the same main features as the tractor shovels to such an extent that there is a high degree of interchangeability of main transmission component parts between tractor shovels and tractor dozers in the same horsepower category.

The range of British-built Michigans to-day also includes pipe handlers and tractor loggers.

*Finishing plant installed by Parkinson Cowan Industrial Products in the new John Bruce factory. This plant comprises dip tanks, conveyors, and infra-red gas-fired paint stoving ovens*





# ABSTRACTS AND REFERENCES

**Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.**

**The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.**

**AUTOMATIC LOAD ADDRESSING BY AN ELECTRIC MONORAIL**
*Mekhanizatsia* (Russia). No. 5-1960. Pp. 8, 9 10 and 11.

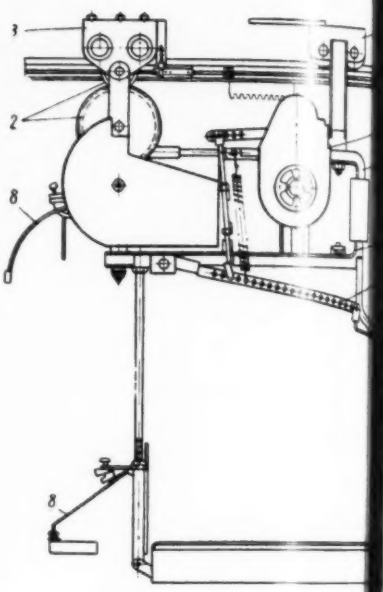
The hoist moves a single rail with inclines up to 35 deg and a minimum radius of curvature of 0·75 m. The trolley upon reaching destination discharges the load automatically and can take up new cargo on its way back to the warehouse. Lifting capacity is 200-250 kg.

The main features of the equipment consist of a frame (1) which is pivotted in order to enable horizontal turns, a reduction box (2) linked to the forward bogie (3) with driven wheels. The rear bogie (4) contains the idling wheels.

The signal panel (7) provides the control of the working state of the automatic unloader. The guard (8) assures a safety arrangement: when it contacts an obstruction the trolley is stopped automatically and restarts only when the former is freed. Power is derived from a low-voltage (36-V) 3-phase motor of 0·6 kW. The driving wheels are rubber tyred in order to increase the adherence to the rail, especially on no-load run on a slope.

The mechanism for directed automatic unloading is made up of two parts: one which counts the number of stations, and the other of the unloading arrangement. The former comprises a pinion which makes one turn when rolling over a rack. The pinion drives through a gear train the wheel which counts the number of stations. The latter is provided with 15 peripheral holes. The unloading mechanism consists of a cam with a cut-out forming one-fifteenth of its circumference.

For addressing the load, the indexing finger is placed in the corresponding hole of the station counting wheel. The latter




is controlled by a pointer of the indicator dial. During the movement of the cam, the follower drops into the cut-out and consequently levers under the action of platforms and loads combined weight are lowered to floor level. This action takes place while the trolley continues to travel. The platform assumes an inclined position helping the load to slide off and the platform is then raised by the rack on the following station.

When the distances between stations are large additional lengths of rack have to be installed. A tension spring facilitates the lift of an empty platform and the clearance between the platform and the floor is controlled by a clutch on the lever and coupling.

**SAVING PALLET LOADING TIME AND LABOUR**
**High-Speed Pallet Loader,** *Modern Materials Handling*, 221 Columbus Avenue, Boston 16, Massachusetts, U.S.A. July, 1960. P. 133. $1.25.

As a means of saving considerable time and labour in pallet-loading operations, the pallet loader known as the 00-RS should be of considerable value applied to many different production and warehousing undertakings. Its design and operating principle are not described, but it is said to be capable of stacking cartons or multi-wall bags on to pallets at rates up

(*Continued on page* 825)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L. J. Hoefkens. 18s. By post 19s.

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Frank C. Woollard, M.B.E., M.I.Mech.E., M.I.Prod.E., M.S.A.E. 25s. By post 26s. 4d.

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**STAMFORD ST., LONDON, S.E.1**

to 33/min. It automatically adjusts itself to oad any standard pallet with 6, 8 or 10 packages/tier. It measures 11 ft long, 6 ft wide and 7 ft high and is self-adjusting to handle packages of any height.

**AIDING SCAFFOLD WORKERS**
**Hoist Assembly Speeds Overhead Installation,** *Plant Engineer*, 308 E. James Street, Barrington, Illinois, U.S.A. August, 1960. P. 191. $1.

Only brief details are given of what is said to function like a mechanical man. It can be attached to scaffolding and lifts materials and places them into required positions for installation. Materials such as fluorescent lighting fixtures, conduits, ducts, piping and sheet metalwork can be handled. They are placed on lifting arms and elevated along a vertical track. Lifting arms then move horizontally on rollers and elevate the material to desired positions for rapid installation.

**REDUCING OVERHEAD CRANE WEAR**
**Crane Rail Lubrication,** *Iron and Steel Engineer*, 1010 Empire Building, Pittsburgh 22, Pennsylvania, U.S.A. August, 1960. Pp. 262-263. $1.50.

A new overhead crane lubrication system is said to multiply the life of the crane wheels nine times and to reduce rail wear by 20 per cent. It is produced in West Germany. It is designed to reduce the wear of the crane wheel flanges and of the rail. Known as the DeLinon lubricator, it is adjustable to any size of rail or crane. It applies a thin film of lubricant, usually 3 to 4 grams/hr of long travel movement, automatically without applying a drop to the rail top surface and causing wheel slip. The system is offered in single-rail, double-rail and combined crane and crane rail models. In the single-rail system one pump feeds lubricant to two pendulum-mounted applicators on the crane end carriage and fitted with circular rollers that are pressed against the rail flanks by their own weight, assisted by tension springs. Lubricant passes through holes in the roller rims which are surfaced with stiff felt. The double-rail system has two pumps, whilst the combined crane and crane rail type is available as a single or double system.

**QUICKER BIN EMPTYING**
**Bunker Vibrator,** *Chemical Engineering*, 330 West 42nd Street, New York 36, N.Y., U.S.A. August 22nd, 1960. Pp. 180-181. 75c.

Bins and bunkers up to 50 ft deep can, it is stated, be emptied of solids without material hold-up at the discharge opening by the use of a new vibrator. It takes the form of a long steel strip that is suspended directly over the discharge opening and vibrated by an electro-mechanical vibrator. When properly vibrated at the top, the whole strip undulates and whips, thus breaking down arches and plugs in the material.

**SEPARATING MIXED LOADS**
**Vibrating Screen Feeder,** *Automation*, Penton, Building, Cleveland 13, Ohio, U.S.A. September, 1960. P. 102. $1.

A combined feeder and conveyor described can separate mixed loads of solid materials, such as sand and gravel, or can be used for rinsing or cooling parts with liquids. It moves the materials to a collection point and deposits them in separate containers. A pneumatic vibrating drive located under the feeder vibrates both the lower tray and the upper tray which is a porous steel screen. Rapid vibratory action sifts the sand from the gravel in the upper tray. This same action moves both sand and gravel along the trays to individual bins. Intensity and frequency of vibration can be regulated by adjusting the air supply.

## RECENT PATENTS

**The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.**

**WRAPPER**
**E. W. Darton, of Isleworth—U.K. 827588.**

Rectangular package wrapper in paper, for single or small stacks of articles, fully automatic with conveyorized feed.

**DITCHING**
**J. J. Smith, of Co. Cork—U.K. 827598.**

Loader etc., for tractor use with a pivoted boom at the rear handling a cable, pulley and grab.

**DUMPER**
**Eagle Engineering Co., Ltd., of Warwick—U.K. 827615.**

Form of door operation for bottom dumpers to avoid incidents with 40-ton loads, using a toggle linkage.

**AGGREGATE WEIGHING**
**Road Machines (Drayton), Ltd.,—U.K. 827758.**

Hopper arrangement for weighing and moving batches of aggregate from component dumps, using a tiltable track and compartmented hopper.

**BULLDOZER**
**General Motors Corporation, of Detroit—U.K. 827814.**

Design with pivoted front and rear sections, to allow rocking and movement over rough ground when working.

**SKIP ARREST**
**Watts, Blake, Bearne & Co., Ltd., of Newton Abbot—U.K. 827840 1.**

Design with trailing sprag to brake the skip if haulage cable breaks, then it releases the main sprag pair. A centrifugal clutch also acts if the skip runs away in reverse inclines by coupling to occasional stretched transverse wires.

**SHEET FEED**
**F. Scroter, of Hanover—U.K. 827872.**

A workpiece, plate or sheet feed, for paper and cardboard, using chain conveyor main feed, stopping at the work point, with the mover element disengaged to give accurate register for embossing and high-speed blanking out operations. This method avoids constant acceleration and retardation of the main conveyor, and reduces wear, etc.

**ELEVATOR**
**Anciens Etablissements Rene Gobert of Paris—U.K. 827934.**

Variable inclination elevator with belt or rollers and a simple winch or gear system for angular alteration.

**TRANSPORT CONTAINER**
**Orienstein Koppel und Lübecker Maschinenbau A.G., of Berlin—U.K. 827938.**

Container handler, divided about the centre, for easy tipping, releasably coupled to train carriage and floats on water for canal towing.

**MOBILE CRANE**
**M. Mlcak, of Czechoslovakia—U.K. 827943.**

Rotary derrick crane not needing cable anchorage, with jib mounted rear of the struts so its weight, and that of the mast and gears, etc., counters that of the load. Circular rotation allowed on track.

**CRANE WHEELS**
**P. M. Worthington—U.K. 827946.**

To avoid flange wear and sinuous paths for cranes, etc., travelling on fixed rail tracks, damping oscillations are introduced by some of the wheels giving a side

correcting force, from their flared out shape.

**BISCUIT HANDLING**
**Hebenstreit G.m.b.H., of Frankfurt—U.K. 827950.**

Way of continuous wafer strip baking on a rotating rim as an envelope mould, using internal gas heating and automatic ejection through a cover drum on to a conveyor with continuous injection of further batter.

**MIXER WINCH**
**Benford, Ltd., of Warwick—U.K. 827988.**

Concrete mixer attachment as a scraper shovel winch and drag line which is simple and cheap and can be an attachment for normal mixers, giving remote control of clutch, and power from the mixer drive.

**PACKAGING**
**Fozgrove Machinery Co., Ltd., of Leeds—U.K. 827995.**

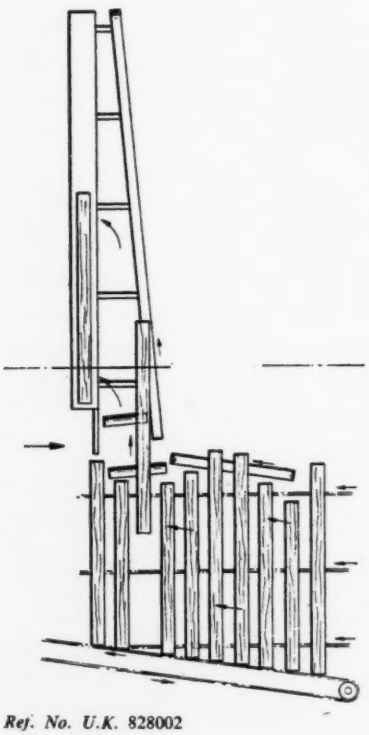
Equipment for heat sealing packages, e.g. biscuits, of various lengths, using a pair of flexible belts, driven the same way and heated, with spring-loaded pressure arrangements across the belt width and pre-heating on the return run. Patent 684252 is mentioned.

**TIMBER SORTING**
**Timber Automation, Ltd.—U.K. 828002.**

Method of sorting according to length and semi-automatic for quality control. A breadthwise conveyor feeds the timber, with side ejection by raising one end of a plank, then feeding off to a lateral conveyor.

**GRAVEL SPREADER**
**A. Thomsen, of Denmark—U.K. 828034.**

Cart container with sloping walls, leading to a slot which opens intermittently by a cam and spring or prong action, with a resilient, e.g. rubber slit.



*Ref. No. U.K.* 828002

**SHIP DISCHARGE**
**Hoesche Werke A.G., of Dortmund—U.K. 828038.**

Inclined ramp for guiding discharge waggons up to tip into rail trucks, etc.

**HOPPER AGITATOR**
**Blending Machine Co., Ltd., of Birmingham—U.K. 828091.**

Device to ensure free flow of material from hoppers, using rotating axis with paddles attached.

**MOBILE CRANE**
**M.A.N., A.G., of Nürnberg—U.K. 828109.**

Slewing crane design with luffing jib mounted on the chassis, and means for supporting luffing cable, by an intermediate piece, roller supported. The aim is to increase the angle between jib and cable, in use.

**JIB CRANE**
**Stahl und Kranbau G.m.b.H., of Hamburg—U.K. 828138.**

Travelling crane which avoids toppling over by auxiliary leg supports automatically operated by load leverage, hydraulically controlled and self removing as load status alters.

**LIFT TRUCK**
**Clark Equipment Co., of Michigan—U.K. 828184.**

For handling heavy steel loads, in reduced turning radius and wheel base, with design for guide mast set between wheel bases.

**TROUGH CONVEYOR**
**Joest G.m.b.H., of Munster—U.K. 828219.**

Where the tube or carrier conveyor is spring-supported and vibrated by simple out-of-balance weights, several layouts being given, elliptic oscillations being possible.

**GRAVITY CHUTE**
**E. Koster, of Bochum—U.K. 828234.**

For underground use, comprising a shaft and fixed and moveable baffles or flaps to control the fall.

**HANGING CONVEYOR**
**D. M. King, of Stevenage—U.K. 828249.**

Design with overhead track trolley and means for moving pusher dogs or retainer abutments out of operation to allow axial sliding, e.g. on inclines. The system is used where the chain is hanger-supported, the hangers themselves being suspended from the track trolleys.

**FAIRLEAD**
**Aveling Barford, Ltd., of Grantham—U.K. 828262.**

Swivelling fair lead, comprising a pair of sheaves mounted for revolution to nearly touch at periphery and so biased about their spaced parallel axes that they normally assume the plane of the ropes when in use. Thus for drag line excavators it is vertical.

**WELL DERRICK**
**Lee C. More Corporation, of Pittsburg—U.K. 828277.**

Arrangement for a tilting mast oil derrick formed from spaced columns connected by a truss. This is useful for off-shore work and the mast can be taken as a construction boom, initially, by appropriate bracing and tilt.

**MECHANICAL SORTER**
**M. Vesely, of Brno—U.K. 828309.**

Cone sorter handler for tapered bearings, which rejects for wrong length, taper diameter, and position, i.e. upside down, using conveyor feed.

**PLATE CONVEYOR**
**K. Petru, of Prague—U.K. 828322.**

Sorting and handling discs for irregular mica sheets, of flat shape, using at least two at the circular conveyor stage, the second one having grippers for transfer.

**SKIP HOIST**
**Wright Boag & Head Wrightson Propy., Ltd., of Johannesburg—U.K. 828387.**

Form with bucket pivoted on bridle top and having a hinged bottom which swings open by action of rails and rollers, the main aim being lighter construction.

**FISH DRESSING**
**Avenco A.B., of Stockholm—U.K. 828426.**

System of conveyor belts with longitudinal feed of small fish past clamps with belly slitters, using spring and pulley arrays.

**COAL CONVEYOR**
**Keir & Cowder, Ltd., of Glasgow—U.K. 828433.**

Stone or ore conveyor which can accept up to ton lumps dropped up to 25 ft, using an articulated resilient set of rails to accept the load at the shock point and prevent undue conveyor wear.

**RAM LIFT**
**G. Poissy, of Paris—U.K. 828444.**

Car, etc., hydraulic ram using the four arms on central common hub, to give any angular separation desired.

**CONVEYOR ATTACHMENT**
**Geo. W. King, Ltd., of Stevenage—U.K. 828463.**

Discuss patents 701610, 785801, and installation of attachment on path to ensure correct processing of load carrier, by enforcing engagement of driving dog or abutment on chain.

**SELF SERVICE STORES**
**Grandona Stores Systems, Inc., of California—U.K. 828471.**

Automatic conveyorized return system for roll-about carry carts in supermarkets, giving easy availability at depots and rapidly clearing pay desk section.

**DAVIT**
**Schat Davits, Ltd., of London—U.K. 828487.**

Hoist for loading spares, etc., for tankers, using worm and drum with crank running or portable motor drive.

**PALLET**
**Diamond Gardner Corporation, of New York—U.K. 828506.**

Paper or fibre pallet, which is disposable and cheap, for use with fork truck, easily stacked by interlocking projections.

**LINK CONVEYOR**
**Chainveyor Corporation, of Los Angeles—U.K. 828538.**

System with travel inside hollow track, pulling through a slot, using pivoted links having support wheels, the aim being cheap and simple design which works on curves or straights.